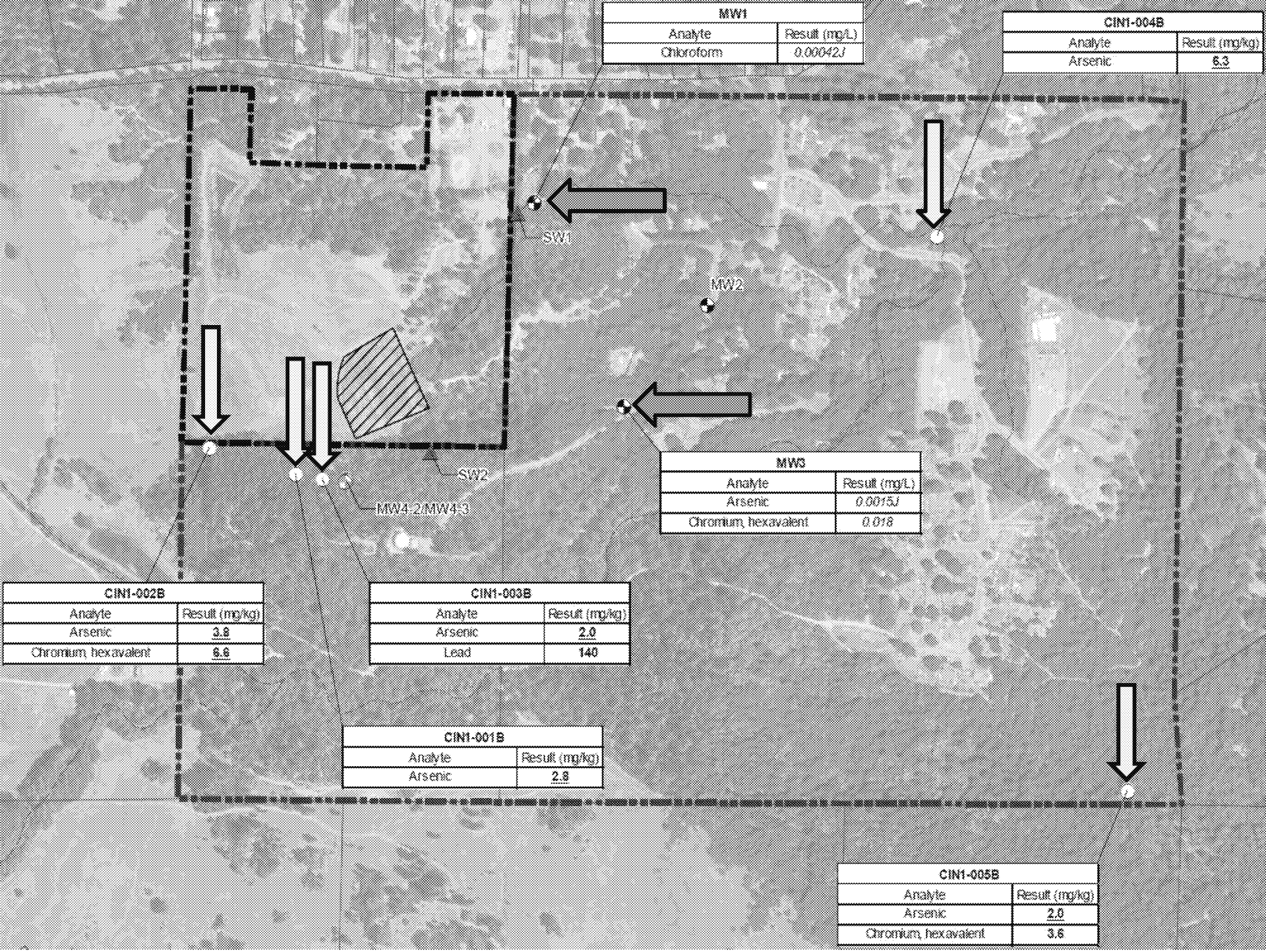
Soils & Water Testing
Laytonville Rancheria - 2017

Introduction

- Introduction of Federal and State Attendees
- Handouts – Definition of Terms
- Background Information
- Drinking Water – Tap Water Tests and Results
- Soil Tests and Results

Background Information

- December 2016 – Tribal contractor (Ahtna) report presented to Agency.
  - Soil tests identified Arsenic, Hexavalent Chromium, and Lead at five sites.
  - Water tests identified Arsenic, Hexavalent Chromium, Lead, and Chloroform at two sites (Old Groundwater Monitoring Wells).



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Background Information – (Con't.)

- Ahtna Report Soil Test Results:
  - Soil Sample C1N1-001B:
    - Arsenic detected at 2.8 mg/kg
  - Soil Sample C1N1-002B:
    - Arsenic detected at 3.8 mg/kg
    - Hexavalent Chromium detected at 6.6 mg/kg.
  - Soil Sample C1N1-003B:
    - Arsenic detected at 3.8 mg/kg
    - Lead detected at 140 mg/kg.

Background Information – (Con't.)

- Soil Sample C1N1-004B:
  - Arsenic detected at 6.3 mg/kg.
- Soil Sample C1N1-005B:
  - Arsenic detected at 2.0 mg/kg
  - Hexavalent Chromium detected at 3.6 mg/kg

Background Information – (Con't.)

- July 2017 – Contract Awarded for testing of soils and tap water on Rancheria.
  - Soils Testing – Phase I & Phase II (if warranted)
  - Soils Testing – Phase III – Metals & Hexavalent Chromium
  - Water – One Test – Residential Taps

Tap Water Testing

Tap Water
Testing Approach Methodology

- Rancheria has been connected to district water system since 1970's.
- Twenty-two homes were selected by the tribe.
- Samples were also taken at the supply tank and tribal office.
- Samples were tested for 42 constituents or "analytes".
- Federal and State Maximum Contaminant Levels (MCLs) standards apply.

Testing Parameters – Tap Water

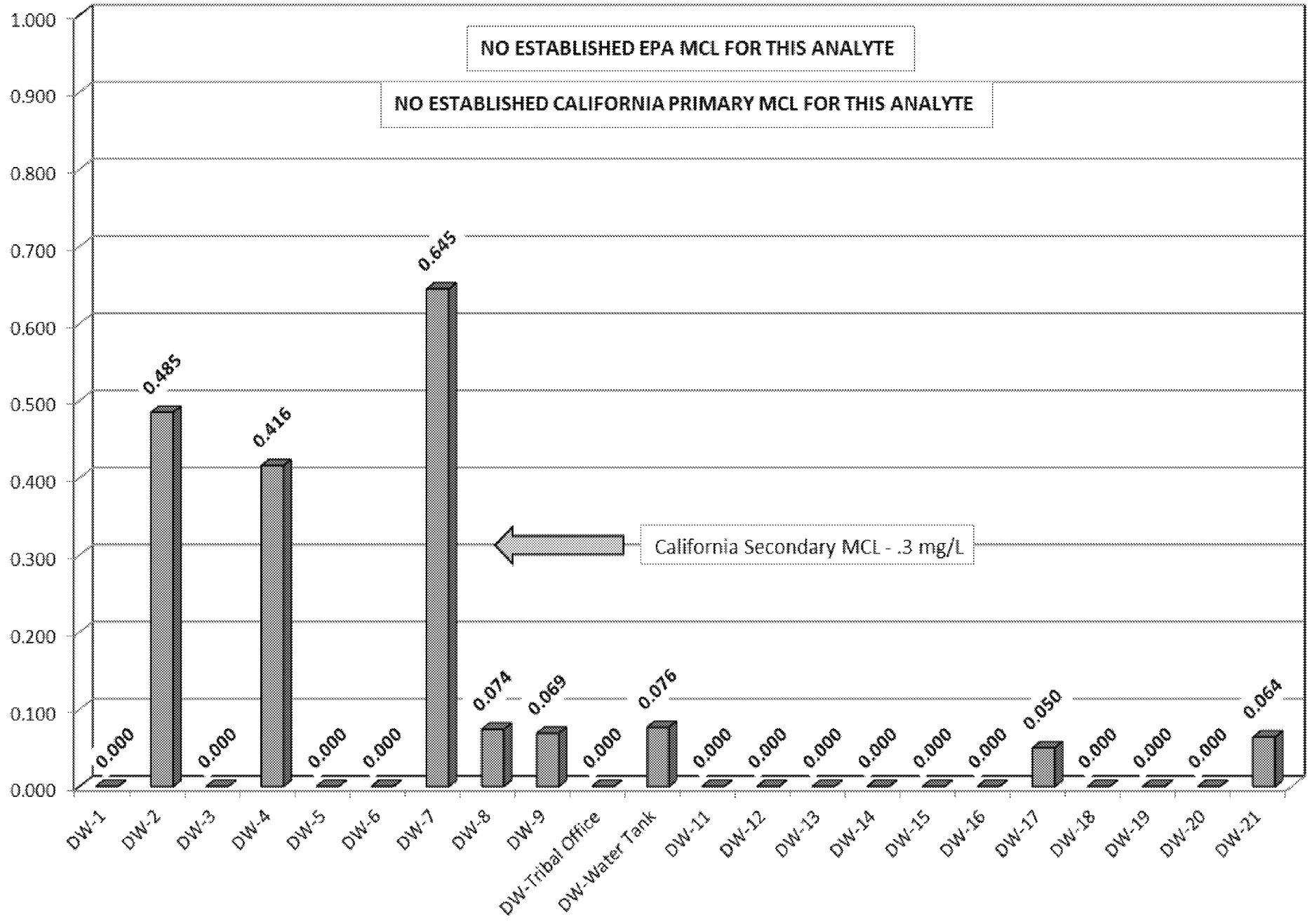
- **Types of Analytes:**
  - Specific Conductance
  - Metals (18)
  - Mercury
  - Anions (5)
  - Volatile Organic Compounds (VOC's – 1)
  - Semi-Volatile Organic Compounds (SVOC's - 1)
  - Alkalinity, Total Dissolved Solids
  - Cyanide, pH Level, Asbestos
  - Perchlorate, Color, Turbidity, Odor
  - MBA's (Methylene Blue Active Substances)
  - Hexavalent Chromium


Legend
TapWater_Sites
Rancheria Boundary
DW-01
DW-03
DW-06
DW-02
DW-05
DW-04
DW-07
DW-09
DW-08
DW-19
DW-20
DW-18
DW-21
DW-14
DW-16
DW-10
DW-17
DW-TK
DW-11
DW-12
DW-15
DW-13
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

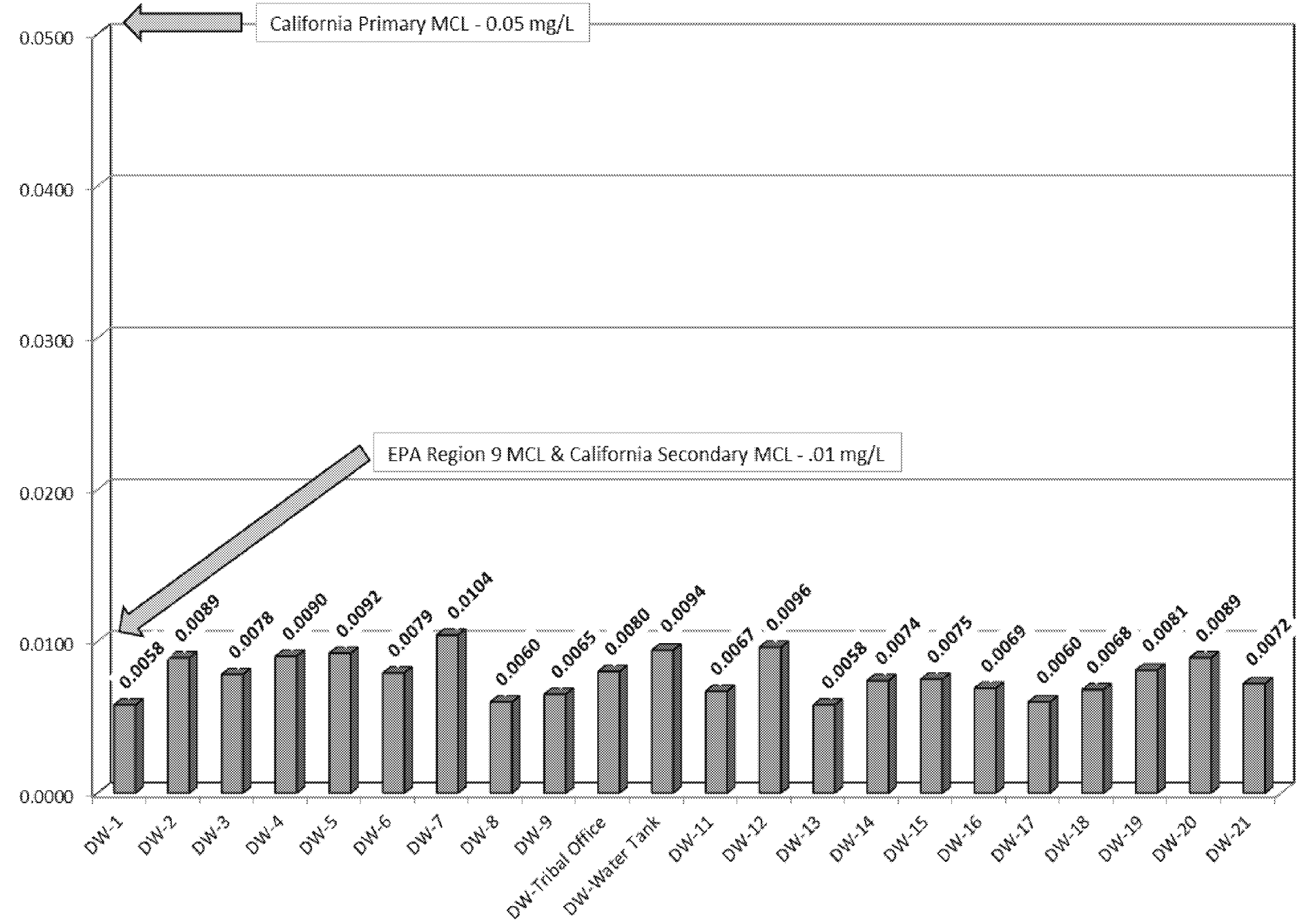
Tap Water Test Results – Overall

- Only 2 analyte MCLs were exceeded:
  - 3 sites exceeded the CA Secondary MCL for Iron.
  - 1 site for exceeded the EPA Regional MCL and CA Secondary MCL for Arsenic.

Tap Water Samples - Iron - mg/L



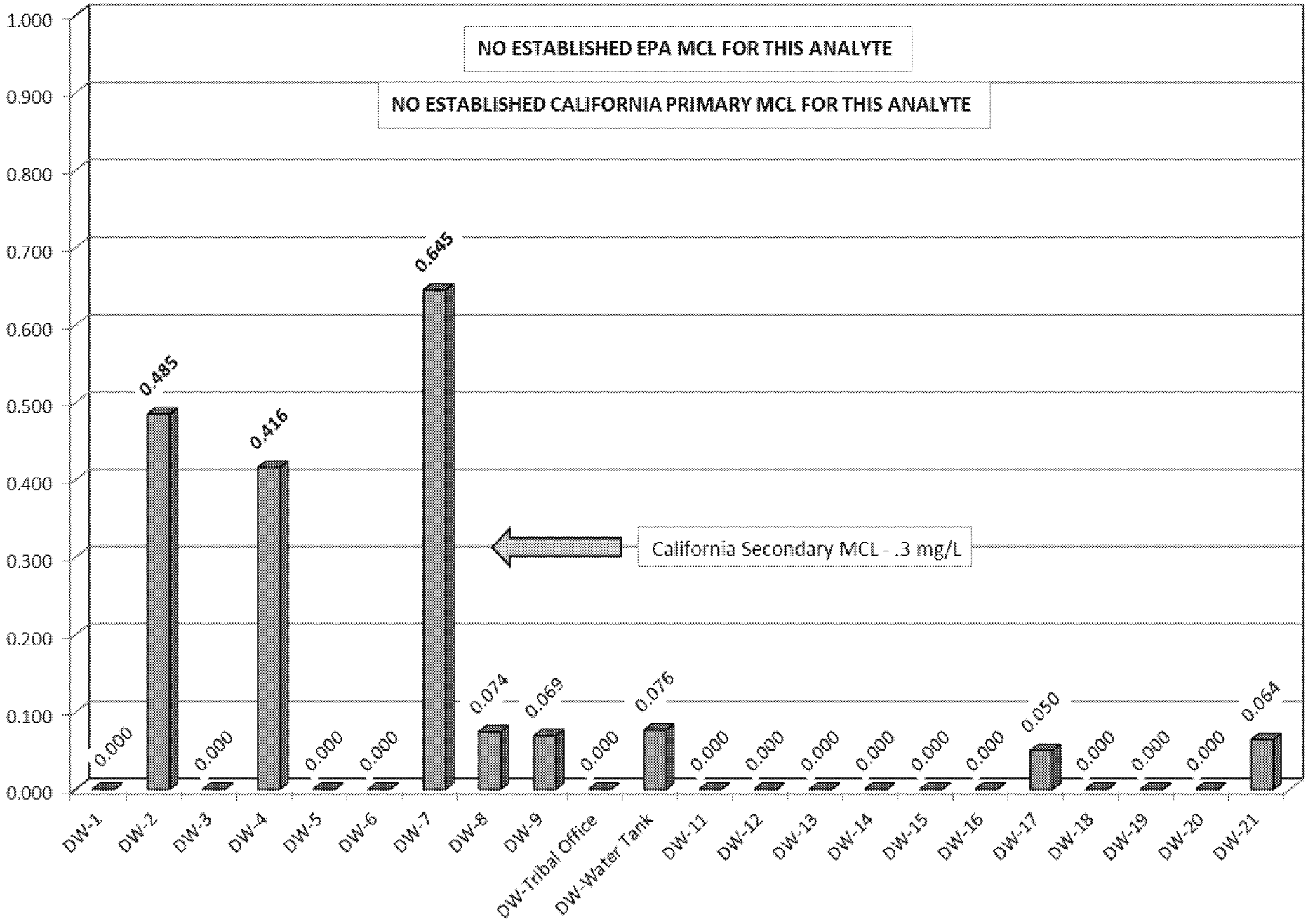
Tap Water Samples - Arsenic - mg/L



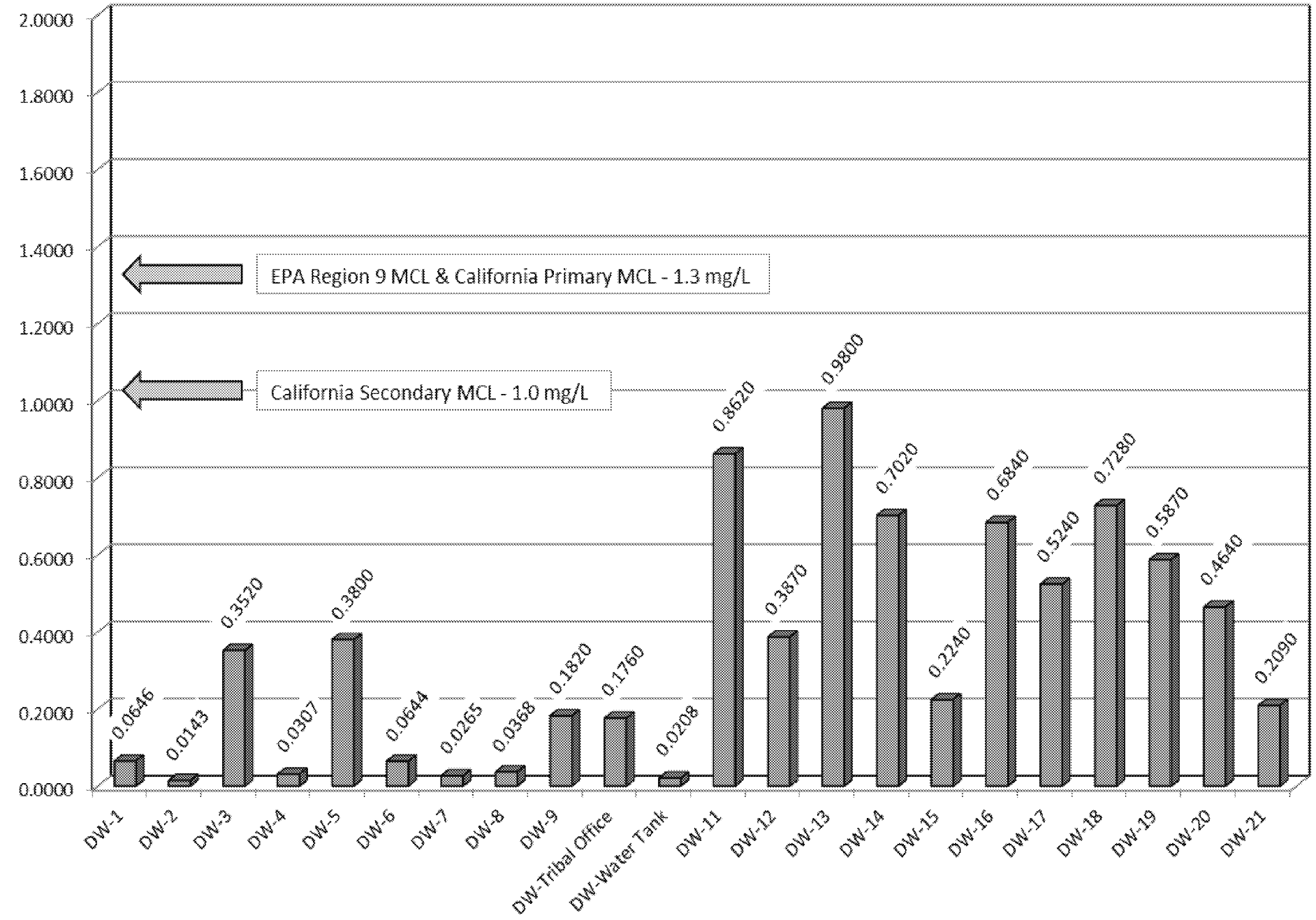
Tap Water Test Results

- Dielectric Effect – Galvanic Corrosion
  - Mismatched plumbing components – Copper and Galvanized Steel or Iron.
  - Causes leaching of elements, such as Iron, to accumulate inside of pipe and into the water itself and could lead to pipe failure.

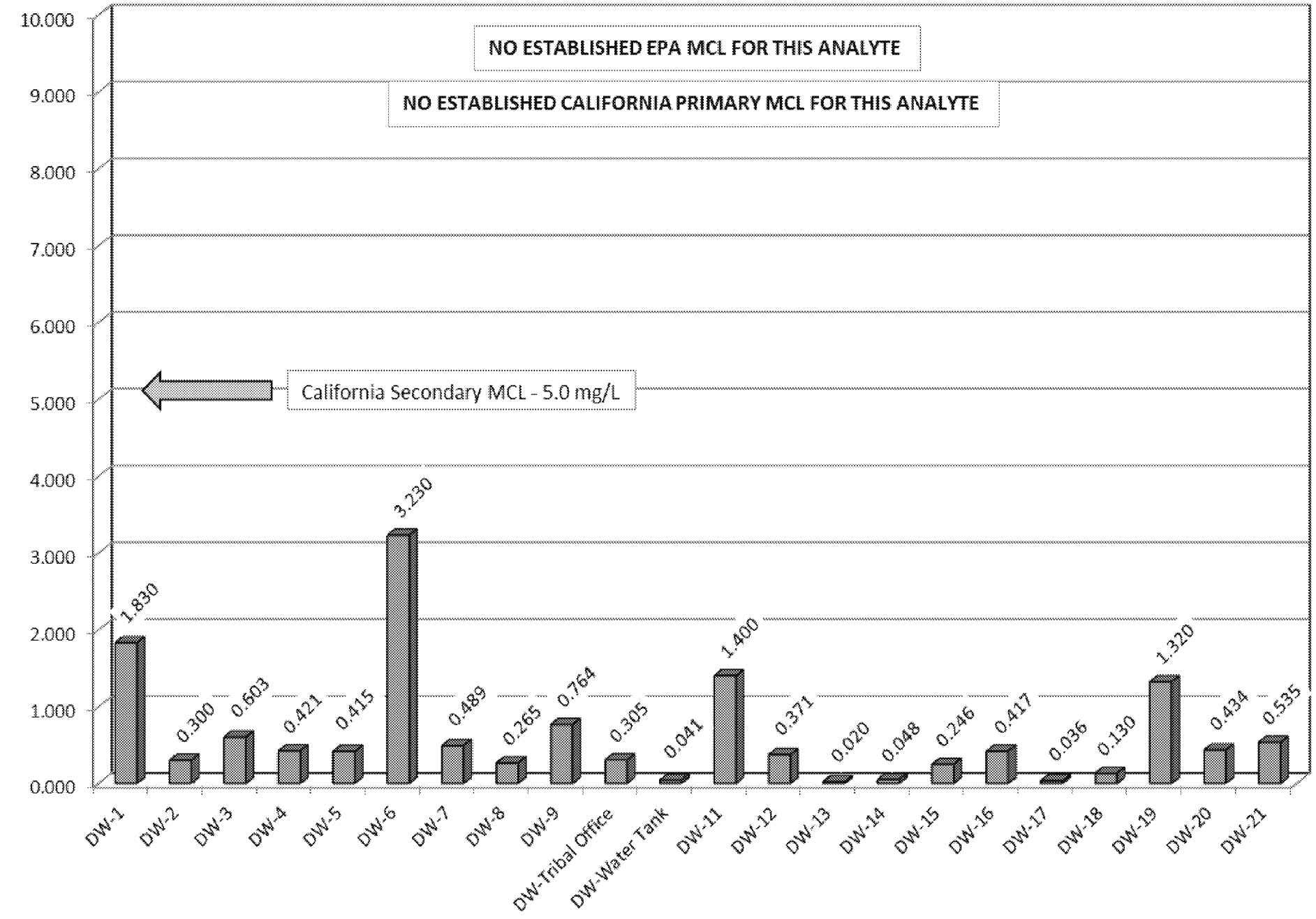
Tap Water Samples - Iron - mg/L



Tap Water Samples - Copper - mg/L



Tap Water Samples - Zinc - mg/L



Tap Water Test Results

- Corrosion Prevention Methods:
  - Using grounding rods instead of grounding to a water line.
  - Using Dielectric Couplings help prevent Galvanic Corrosion.
  - Wrapping water lines in plastic or rubber prevents galvanic corrosion. Wrapping prevents stray current from being conducted by pipes.

Tap Water Test Results

- Laytonville Water District
  - District test results are consistent with our test results for Arsenic and Hexavalent Chromium.
  - Low levels of Arsenic.
  - Hexavalent Chromium was not detected.

- Individual test results can be mailed upon written request.

Questions?

Soil Testing

Soils – Phase I
Testing Approach Methodology

- Tribal land divided into 20 testing areas or Quadrants:
  - Broad in scope (shotgun approach)
  - Five samples per quadrant – 100 samples total
  - 100 samples combined into 20 composite samples


Legend
Quadrants
Rancheria Boundary
Quad 01
Quad 02
Quad 03
Quad 04
Quad 05
Quad 06
Quad 07
Quad 08
Quad 09
Quad 10
Quad 11
Quad 12
Quad 13
Quad 14
Quad 15
Quad 16
Quad 17
Quad 18
Quad 19
Quad 20
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,
AeroGRID, IGN, and the GIS User Community


Legend
Proposed Sample Location
Quadrants
Rancheria Boundary
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Legend
Actual Sample Location
Quadrants
Rancheria Boundary
Quad 01
Quad 02
Quad 03
Quad 04
Quad 05
Quad 06
Quad 07
Quad 08
Quad 09
Quad 10
Quad 11
Quad 12
Quad 13
Quad 14
Quad 15
Quad 16
Quad 17
Quad 18
Quad 19
Quad 20
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Testing Parameters - Soil

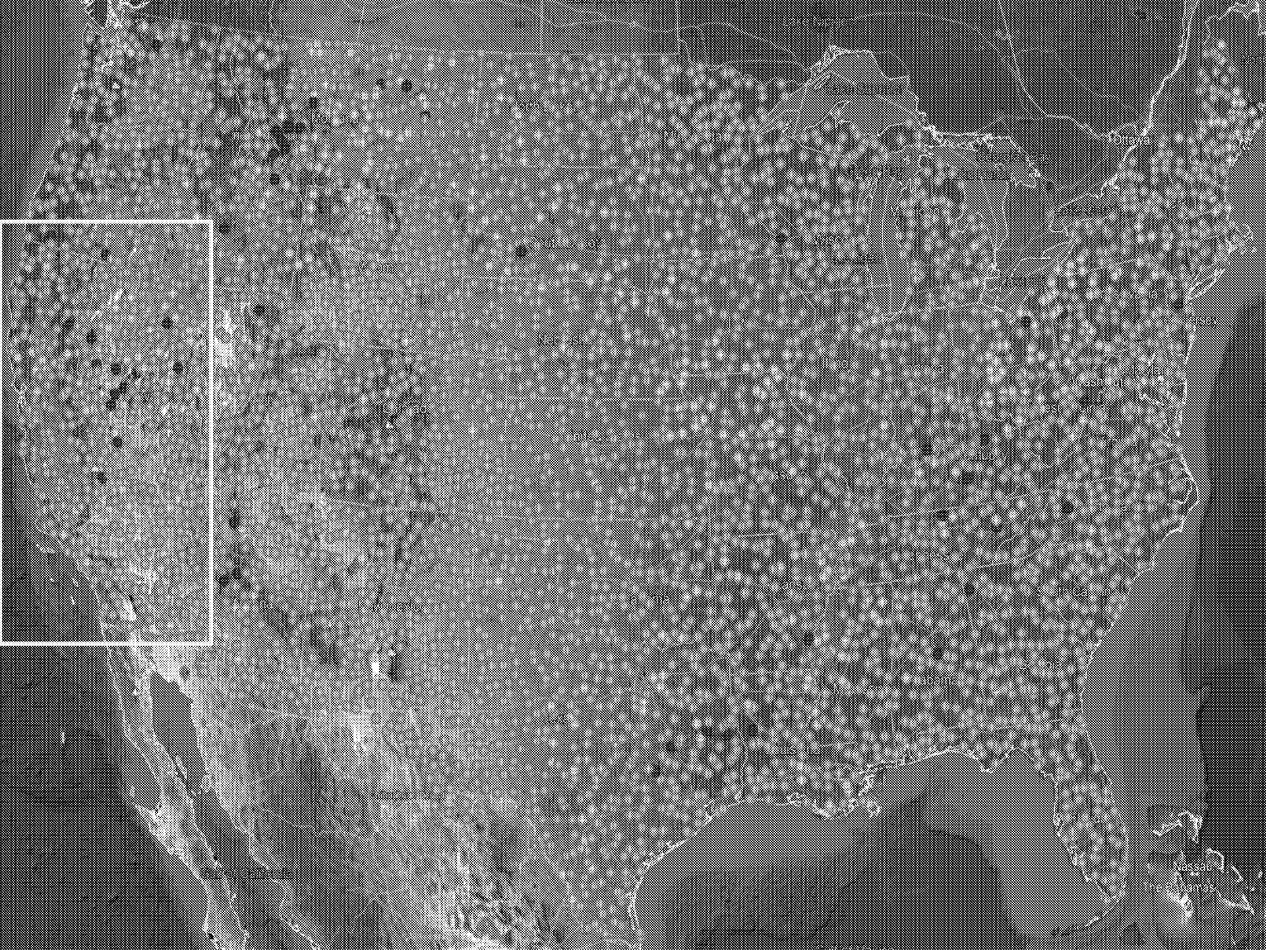
- Tested for 196 Compounds or "Analytes"
- Federal EPA Testing Protocols used.
- Standard is Regional Screening Level (RSL)

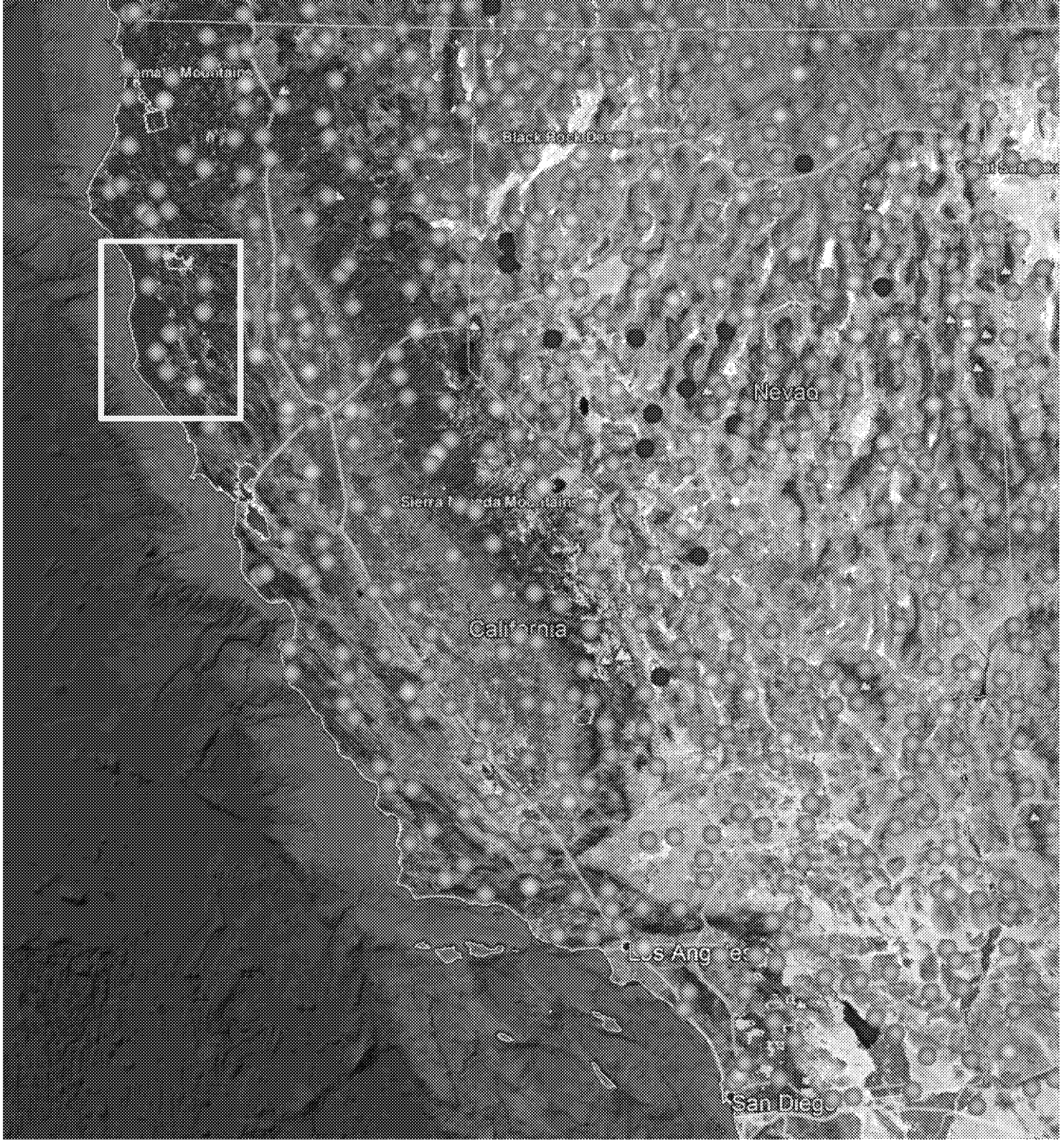
Testing Parameters - Soil

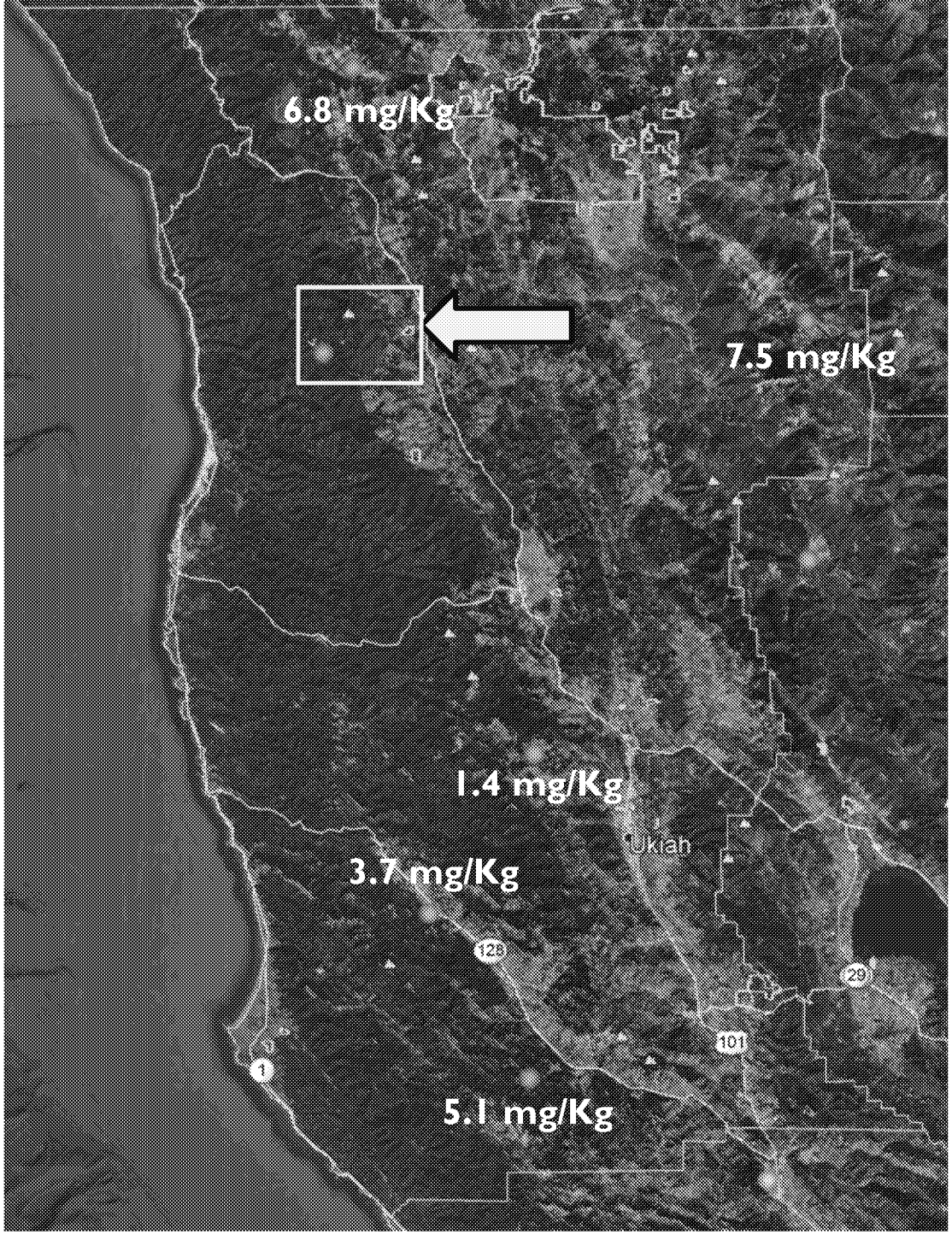
- **Types of Analytes:**
  - Petroleum Hydrocarbons (4)
  - Metals (18) (Includes Hexavalent Chromium)
  - Polychlorinated biphenyl's (PCB's) (7)
  - Chlorinated Herbicides (10)
  - Volatile Organic Compounds (VOC's) (30)
  - Low Level Semi-Volatiles (20)
  - Polycyclic Aromatic Hydrocarbons (48)
  - Organochlorine Pesticides (22)
  - Dioxins/Furans (17)
  - Perfluorinated Chemicals (PFCs) (2)
  - Moisture Percentage

Phase I Test Results – Soil

- Based on test results, two concerns came forth: Arsenic levels and Dioxin Toxicity.
- Hexavalent Chromium (aka Chromium 6) was not detected.
- Arsenic was detected above the RSL of .68 mg/kg.
- Arsenic is a naturally occurring background element.

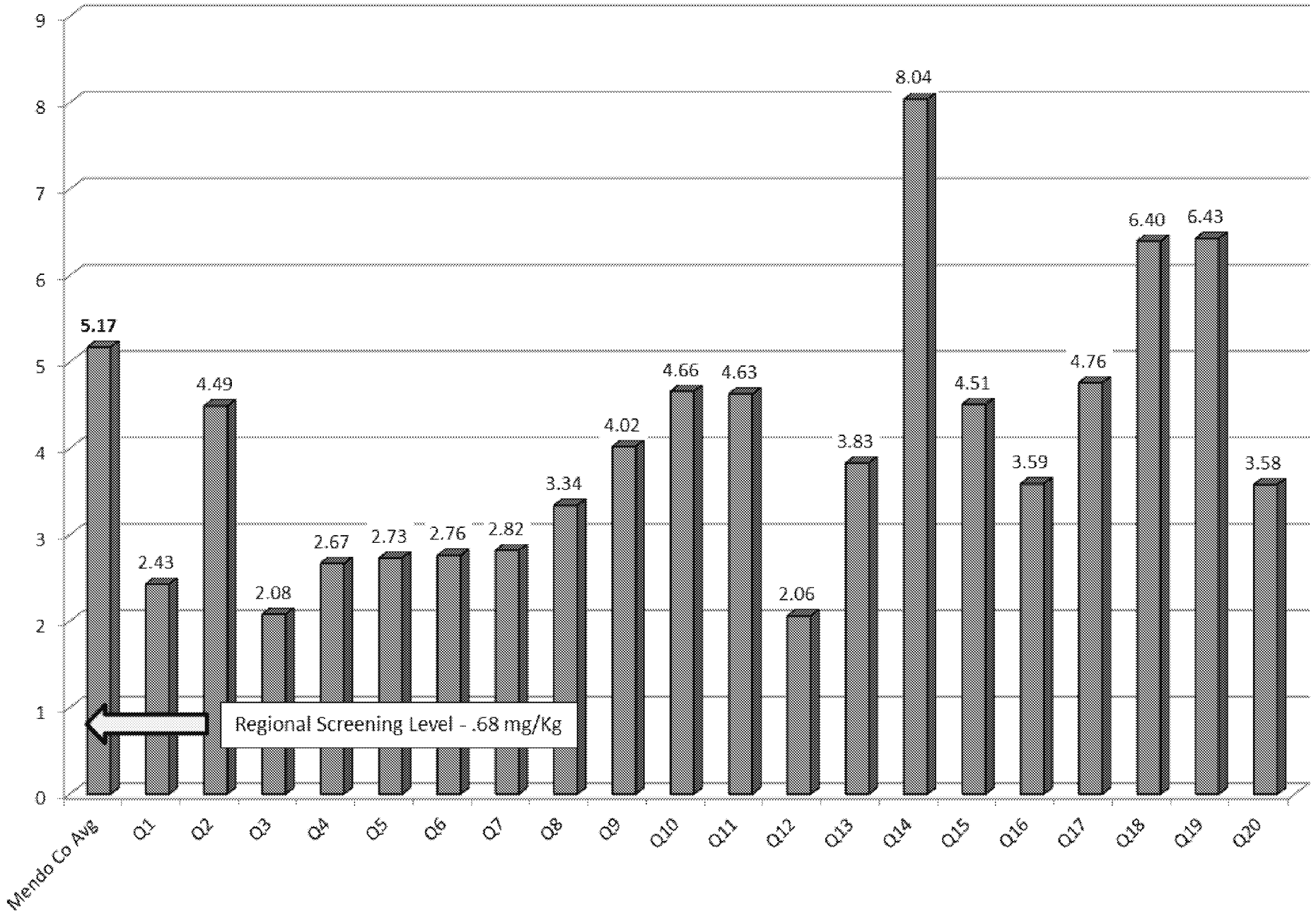


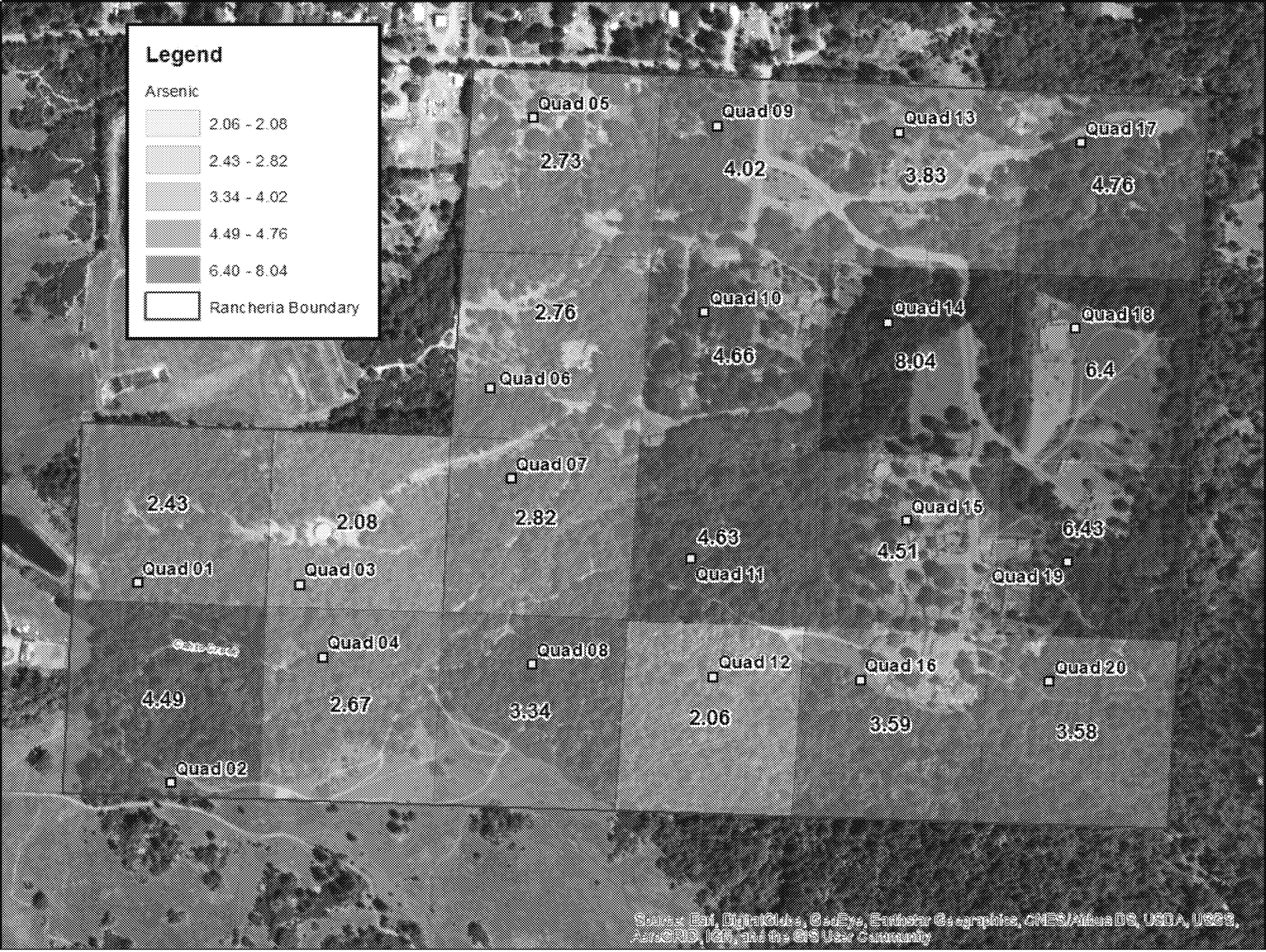

Nevada
California
Los Angeles
San Dieg

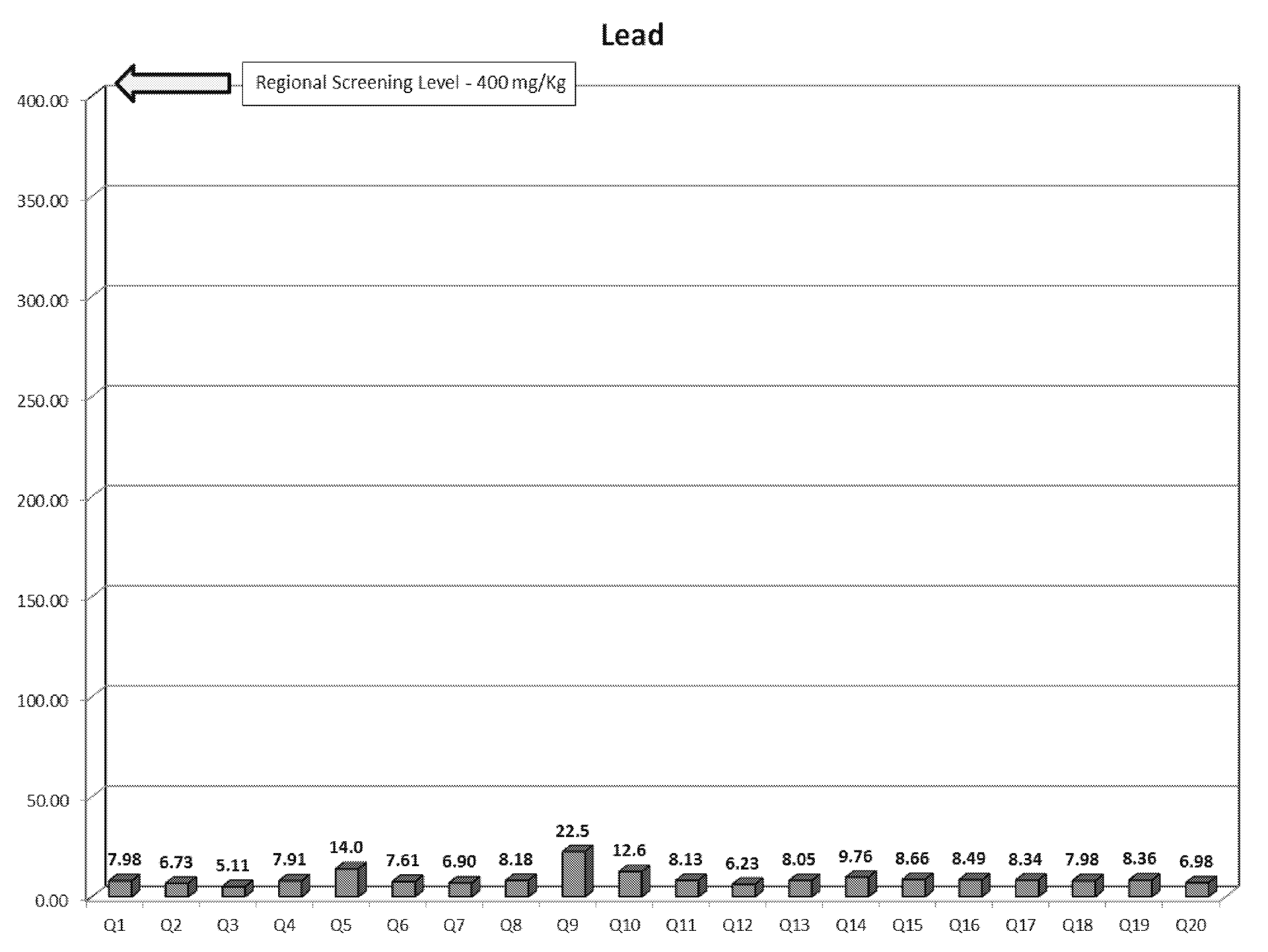

6.8 mg/Kg
7.5 mg/Kg
1.4 mg/Kg
Ukiah
3.7 mg/Kg
5.1 mg/Kg


Branscomb
6.5 mg/kg
Branscomb Rd

Arsenic


9
8
7
6
5
4
3
2
1
0
5.17
2.43
4.49
2.08
2.67
2.73
2.76
2.82
3.34
4.02
4.66
4.63
2.06
3.83
8.04
4.51
3.59
4.76
6.40
6.43
3.58
Regional Screening Level - .68 mg/Kg
Mendo Co Avg
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20


Legend
Arsenic
2.06 - 2.08
2.43 - 2.82
3.34 - 4.02
4.49 - 4.76
6.40 - 8.04
Rancheria Boundary
Quad 05
2.73
Quad 09
4.02
Quad 13
3.83
Quad 17
4.76
Quad 10
2.76
Quad 14
4.66
Quad 18
8.04
6.4
Quad 06
Quad 07
2.82
2.43
2.08
Quad 15
4.63
6.43
4.51
Quad 01
Quad 03
Quad 11
Quad 19
Quad 04
Quad 08
Quad 12
Quad 16
Quad 20
4.49
2.67
3.34
2.06
3.59
3.58
Quad 02
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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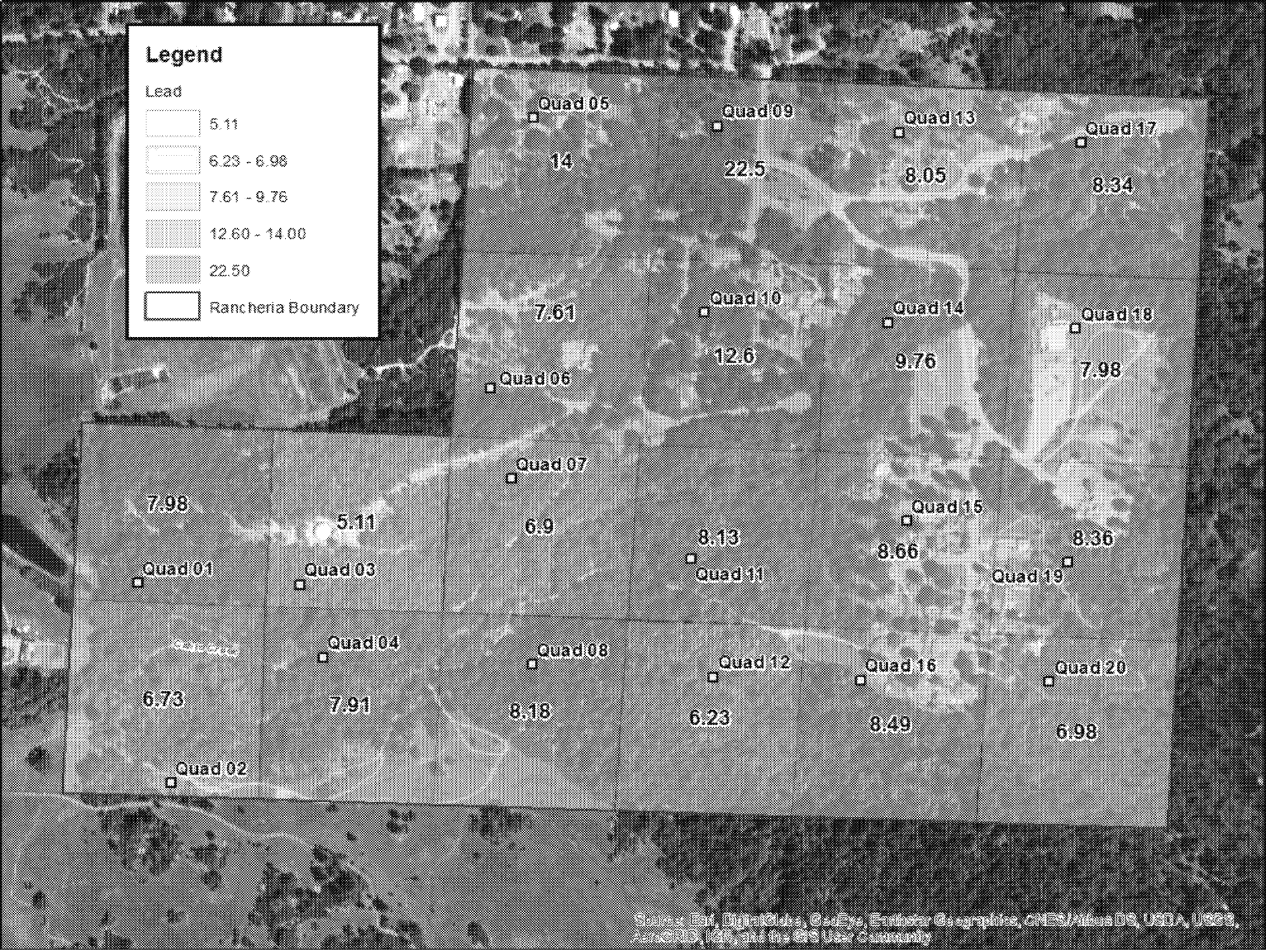
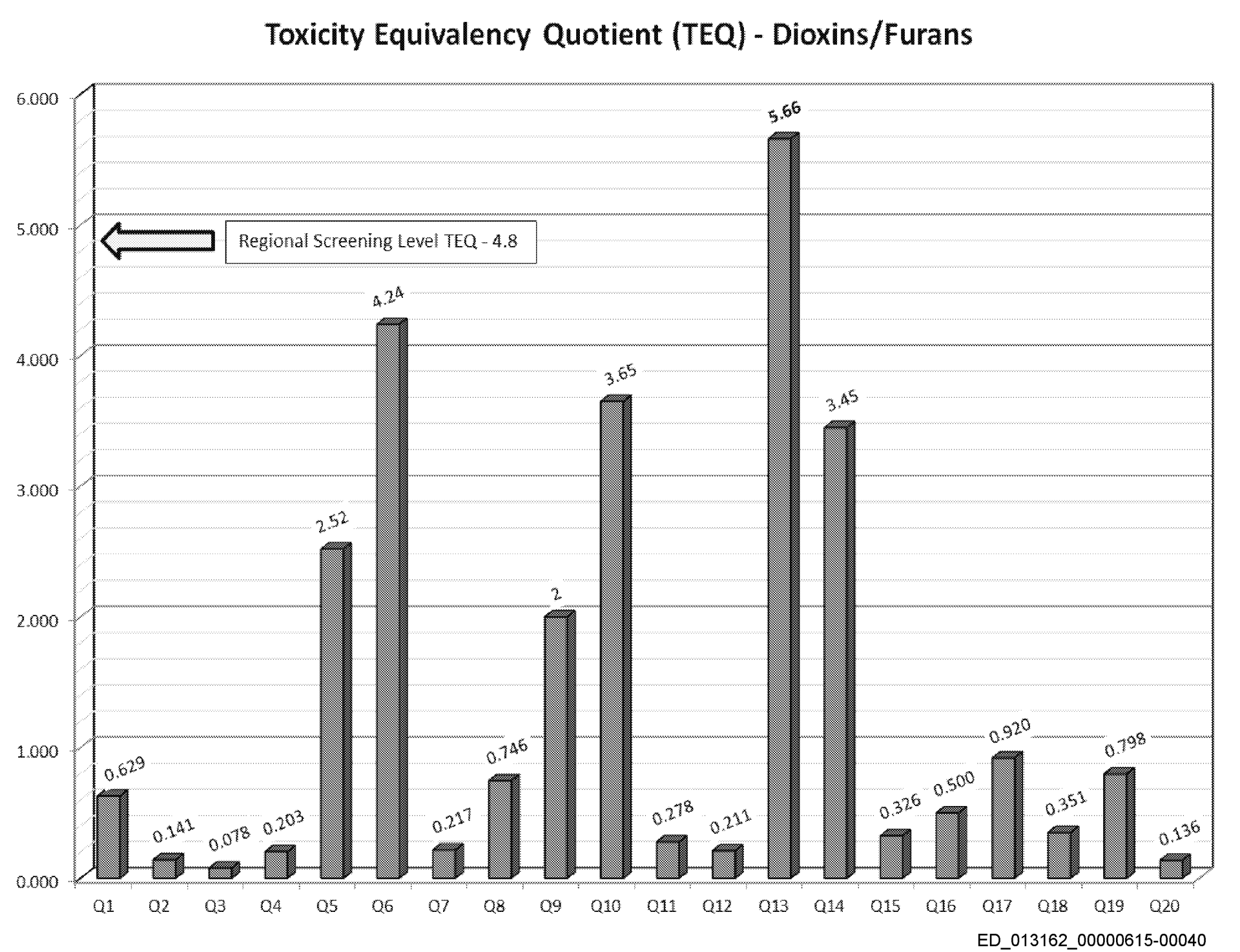

Legend
Lead
5.11
6.23 - 6.98
7.61 - 9.76
12.60 - 14.00
22.50
Rancheria Boundary
Quad 01
7.98
Quad 02
6.73
Quad 03
5.11
Quad 04
7.91
Quad 05
14
Quad 06
7.61
Quad 07
6.9
Quad 08
8.18
Quad 09
22.5
Quad 10
12.6
Quad 11
8.13
Quad 12
6.23
Quad 13
8.05
Quad 14
9.76
Quad 15
8.66
Quad 16
8.49
Quad 17
8.34
Quad 18
7.98
Quad 19
8.36
Quad 20
6.98
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Dioxins/Furans

- Soils tested for 17 compounds.
  - 7 Dioxin Compounds
  - 10 Furan Compounds
- Contamination level expressed a Toxicity Equivalency Quotient (TEQ)
- Regional Screening Level TEQ – 4.8

Dioxins/Furans - TEQ

- A TEQ rating is a weighted quantity measure based on the toxicity of each member of the dioxin and dioxin-like compounds category relative to the most toxic members of the category.



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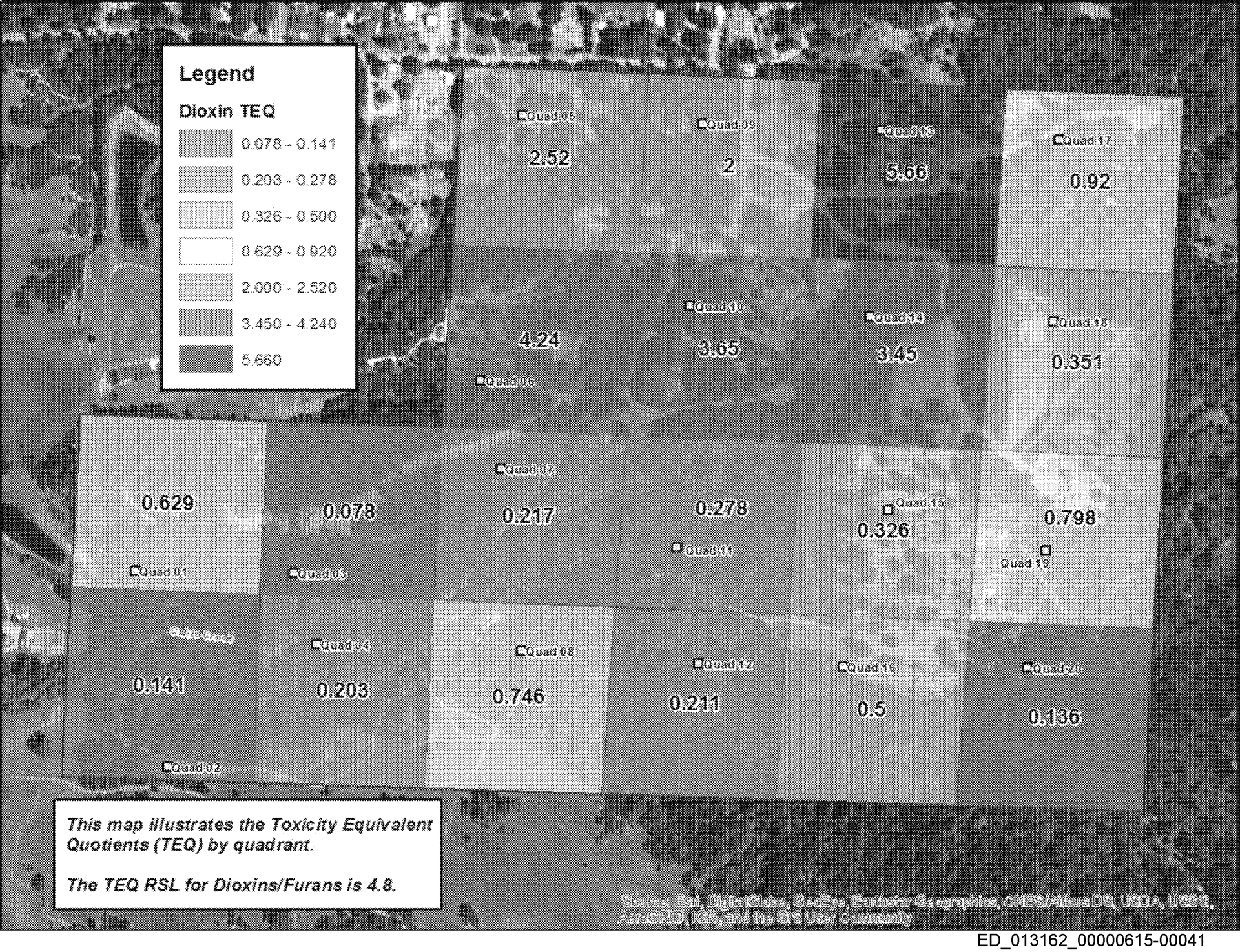

Legend
Dioxin TEQ
0.078 - 0.141
0.203 - 0.278
0.326 - 0.500
0.629 - 0.920
2.000 - 2.520
3.450 - 4.240
5.660
Quad 01
0.629
Quad 02
0.141
Quad 03
0.078
Quad 04
0.203
Quad 05
2.52
Quad 06
4.24
Quad 07
0.217
Quad 08
0.746
Quad 09
2
Quad 10
3.65
Quad 11
0.278
Quad 12
0.211
Quad 13
5.66
Quad 14
3.45
Quad 15
0.326
Quad 16
0.5
Quad 17
0.92
Quad 18
0.351
Quad 19
0.798
Quad 20
0.136
This map illustrates the Toxicity Equivalent Quotients (TEQ) by quadrant.
The TEQ RSL for Dioxins/Furans is 4.8.
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Questions?

Phase II Testing - Soil

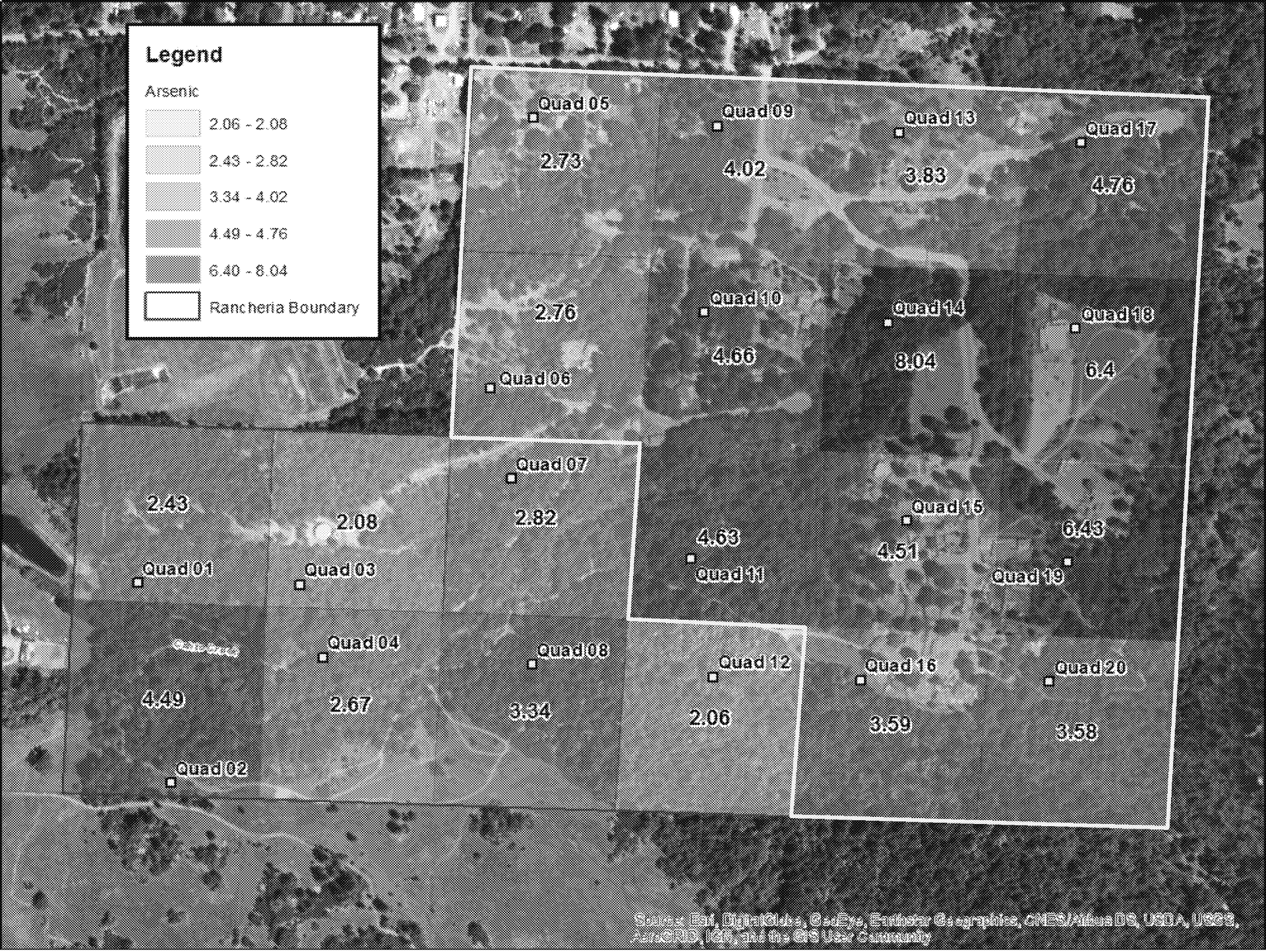
- Phase II testing would be implemented if a high level of contamination was found.
- Phase II testing samples were not composite samples, but individual samples and were tested as individual samples.
- Provides more precision in terms of location only.
- Phase II testing conducted in residential areas only.

Phase II Testing - Soil

- Soils were tested for:
  - Title 22 Metals
    - Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc, Mercury, and Hexavalent Chromium
  - Dioxins/Furans

Phase II Testing Results

- Arsenic was only analyte that had levels above RSL of .68 mg/Kg.
- Based on 65 soil sampling sites, Arsenic level average on tribal land is 4.22 mg/Kg with a low of 1.58 and a high of 10.30.
- USGS soil data for Mendocino County – Arsenic content average is 5.17 mg/Kg.



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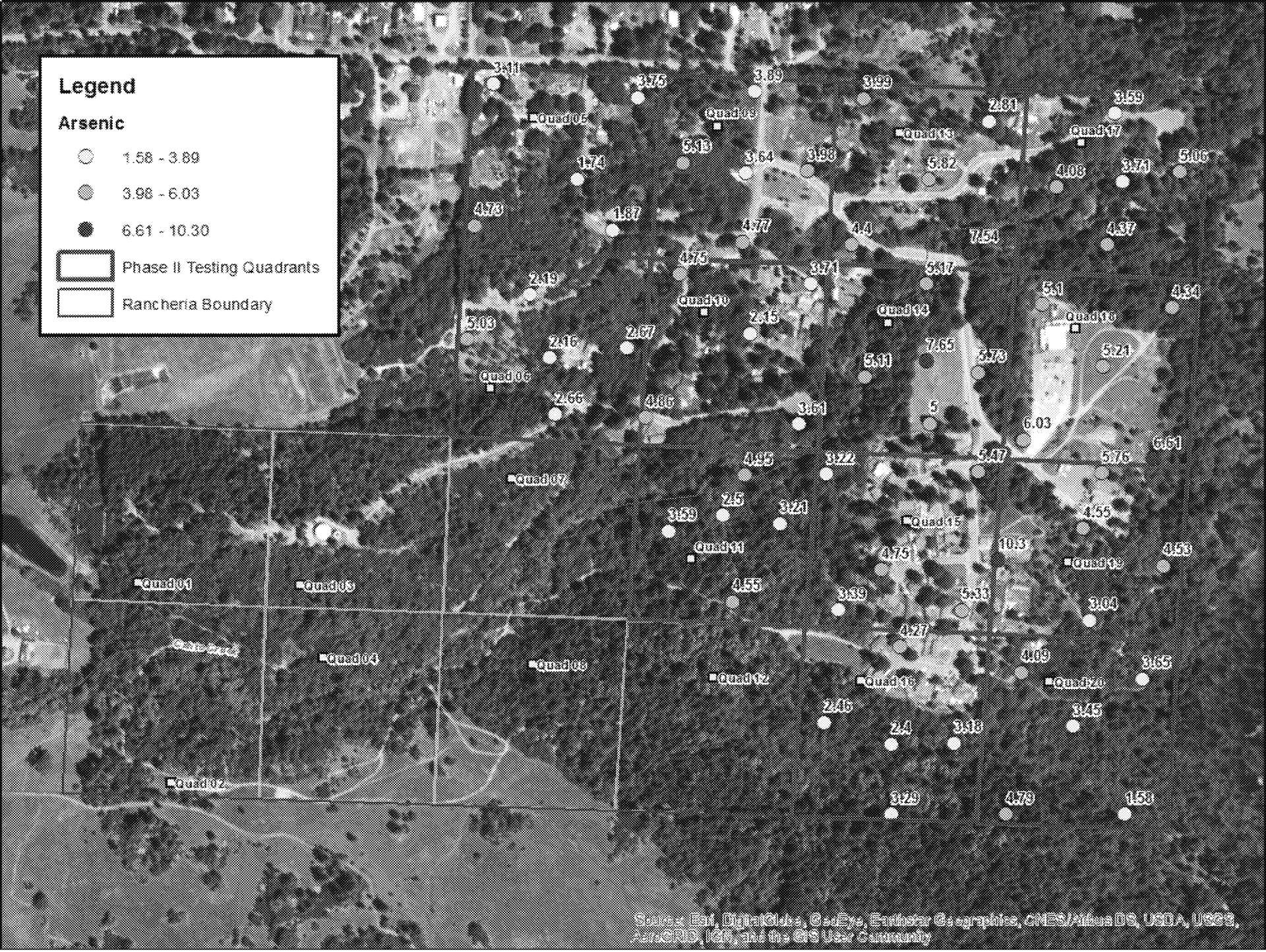
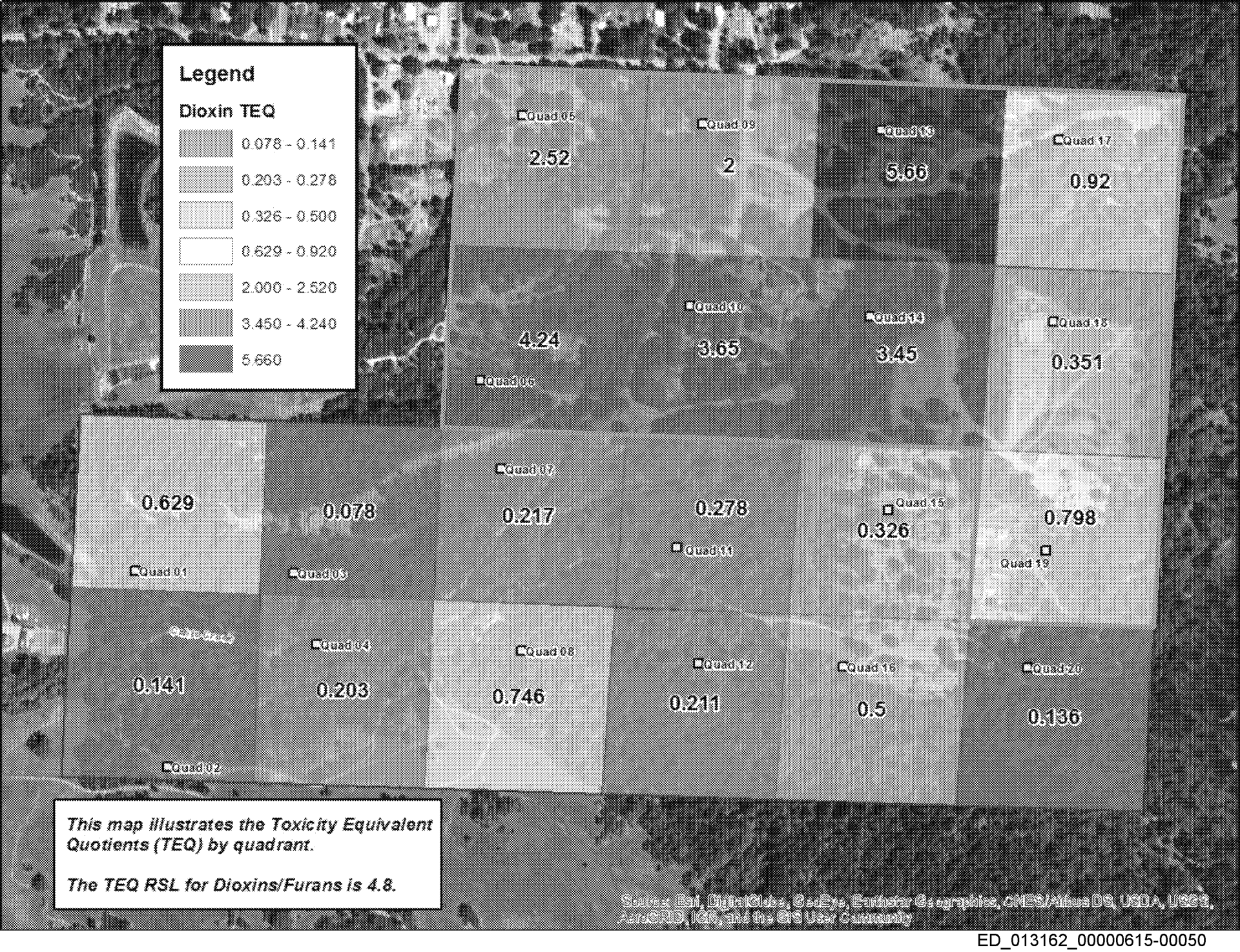
Legend
Phase II Sample Locations - Arsenic
Phase II Testing Quadrants
Rancheria Boundary
Quad01
Quad02
Quad03
Quad04
Quad05
Quad06
Quad07
Quad08
Quad09
Quad10
Quad11
Quad12
Quad13
Quad14
Quad15
Quad16
Quad17
Quad18
Quad19
Quad20
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Legend
Arsenic
1.58 - 3.89
3.98 - 6.03
6.61 - 10.30
Phase II Testing Quadrants
Rancheria Boundary
Quad01
Quad02
Quad03
Quad04
Quad05
Quad06
Quad07
Quad08
Quad09
Quad10
Quad11
Quad12
Quad13
Quad14
Quad15
Quad16
Quad17
Quad18
Quad19
Quad20
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Phase II Test Results

- 45 soil samples were taken and tested for Dioxin/Furan toxicity levels.
- 5 locations had a TEQ higher than RSL of 4.8.



This map illustrates the Toxicity Equivalent Quotients (TEQ) by quadrant.

The TEQ RSL for Dioxins/Furans is 4.8.


Legend
Phase II Sample Locations - Dioxins/Furans
Phase II Testing - Dioxin/Furan
Rancheria Boundary
Quad01
Quad02
Quad03
Quad04
Quad05
Quad06
Quad07
Quad08
Quad09
Quad10
Quad11
Quad12
Quad13
Quad14
Quad15
Quad16
Quad17
Quad18
Quad19
Quad20
38
39
41
58
79
83
40
42
43
44
80
81
82
85
36
37
45
76
77
84
46
47
74
32
86
87
50
33
34
35
75
73
72
88
49
48
71
89
90
92
91
93
94
95
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Legend
High TEQ Locations
Phase II Testing - Dioxin/Furan
Rancheria Boundary
5.25
5.3
60.9
5.9
6.52
Quad05
Quad09
Quad13
Quad17
Quad10
Quad14
Quad18
Quad06
Quad07
Quad15
Quad11
Quad19
Quad01
Quad03
Quad04
Quad08
Quad12
Quad16
Quad20
Quad02
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Questions?

Phase III Testing - Soil

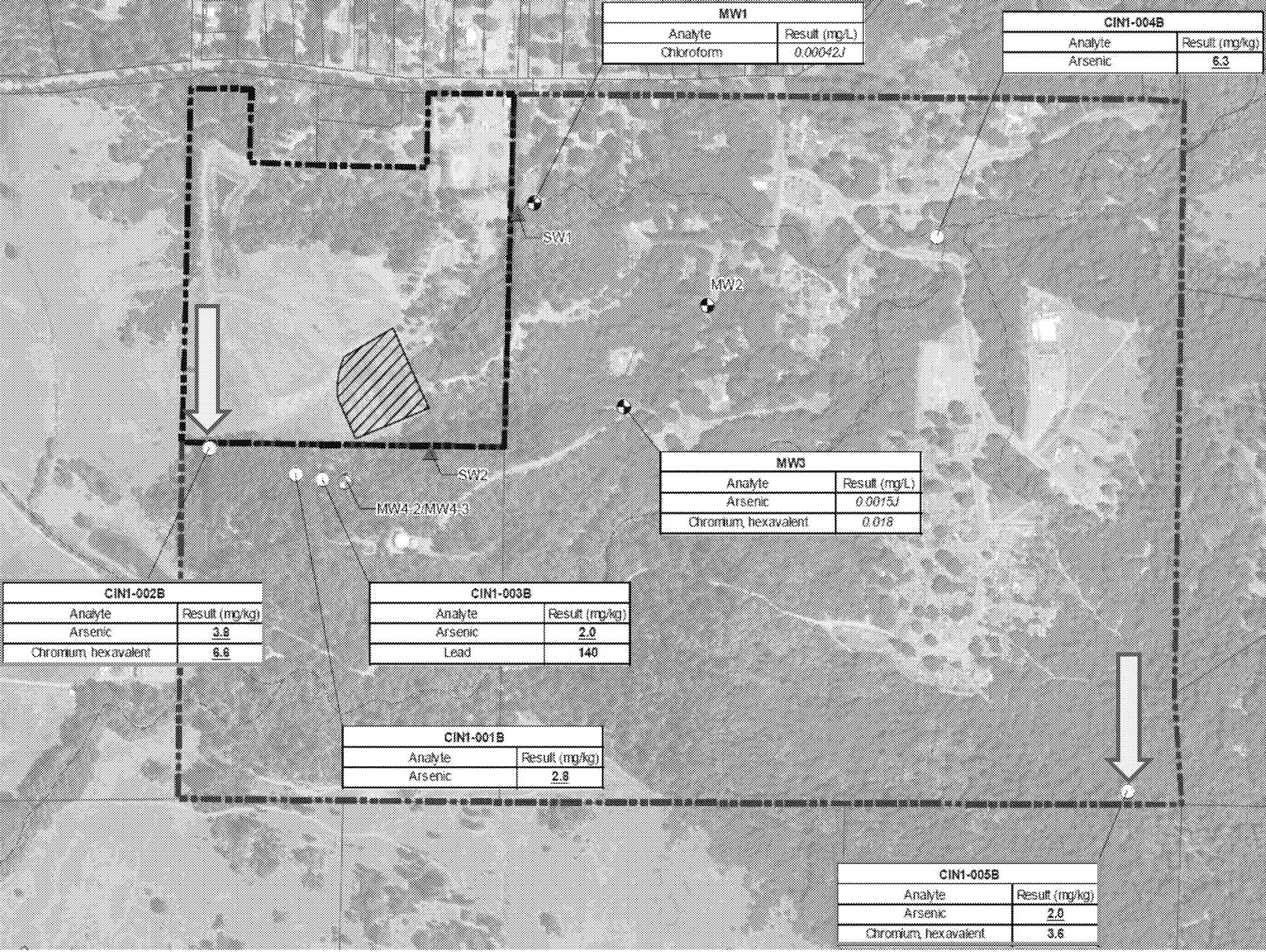
- Phase III testing was initiated to test two specific locations where high levels of Hexavalent Chromium was found by Ahtna (tribal contractor).
- 50 individual samples were taken including the locations where the detection of Hexavalent Chromium was detected.
- 25 samples at site CIN1-002B
- 25 samples at site CIN1-005B

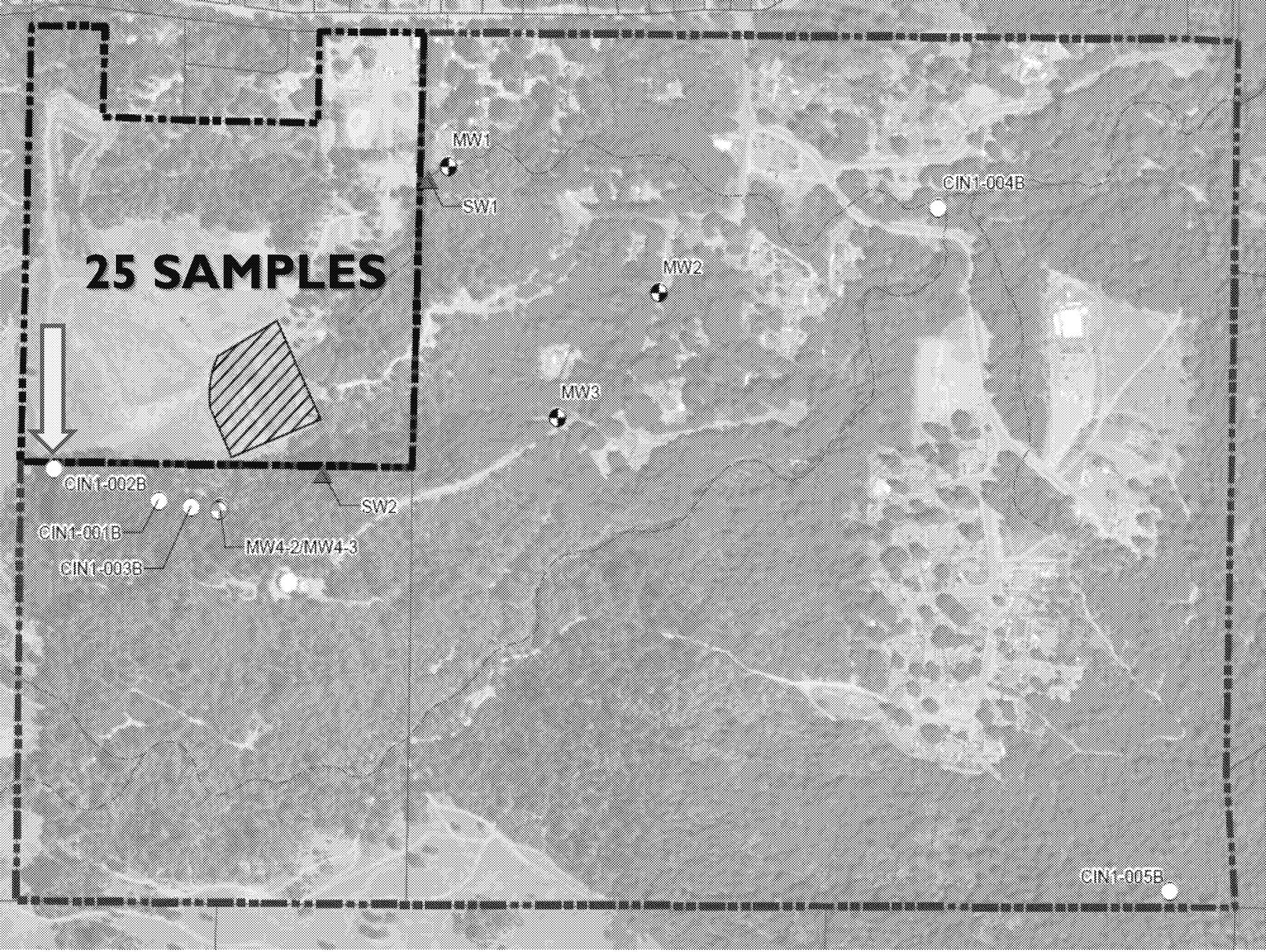
Phase III Testing - Soil

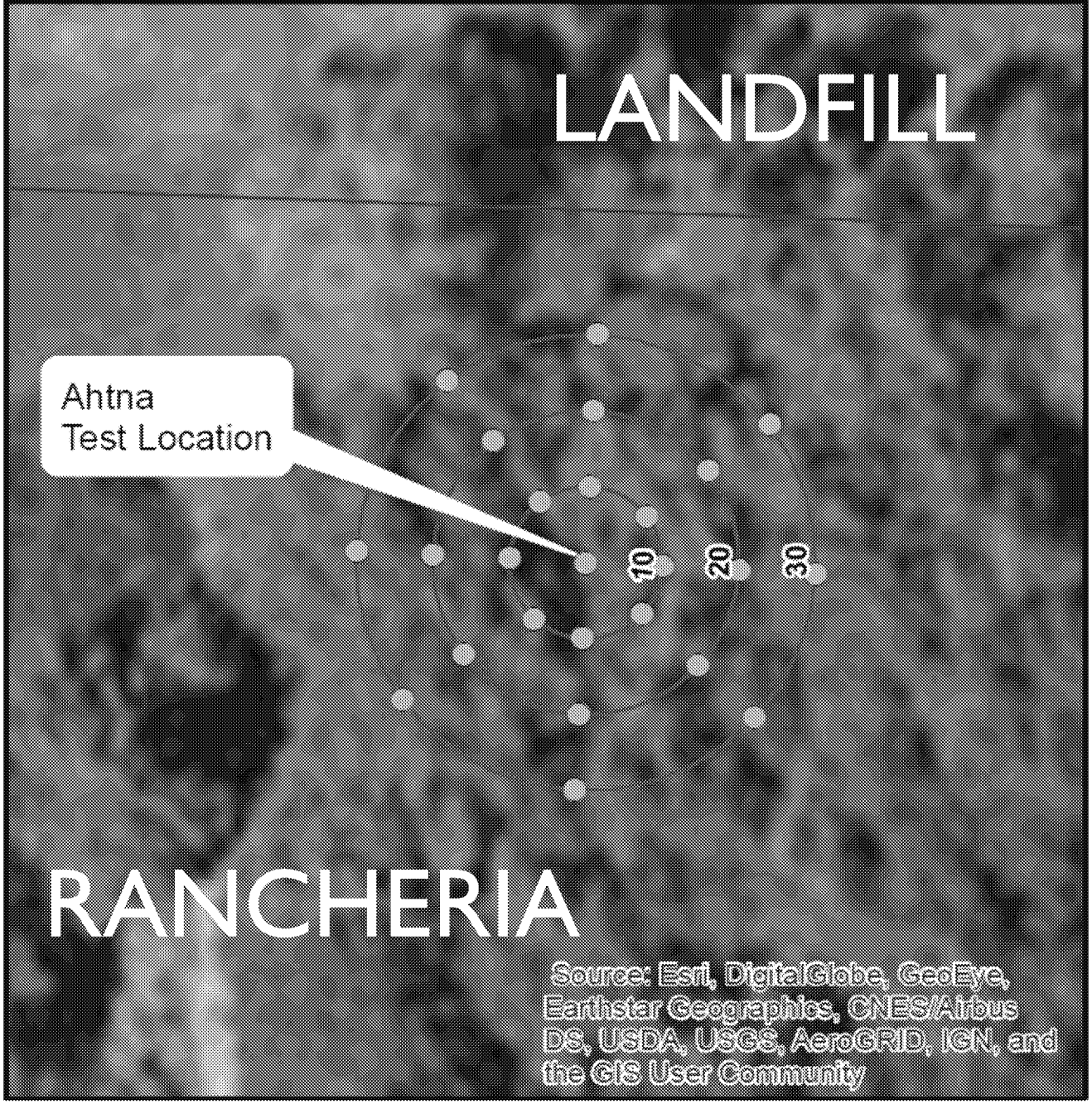
- Soils were tested for:
  - Title 22 Metals:

    Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc, Mercury, and Hexavalent Chromium.

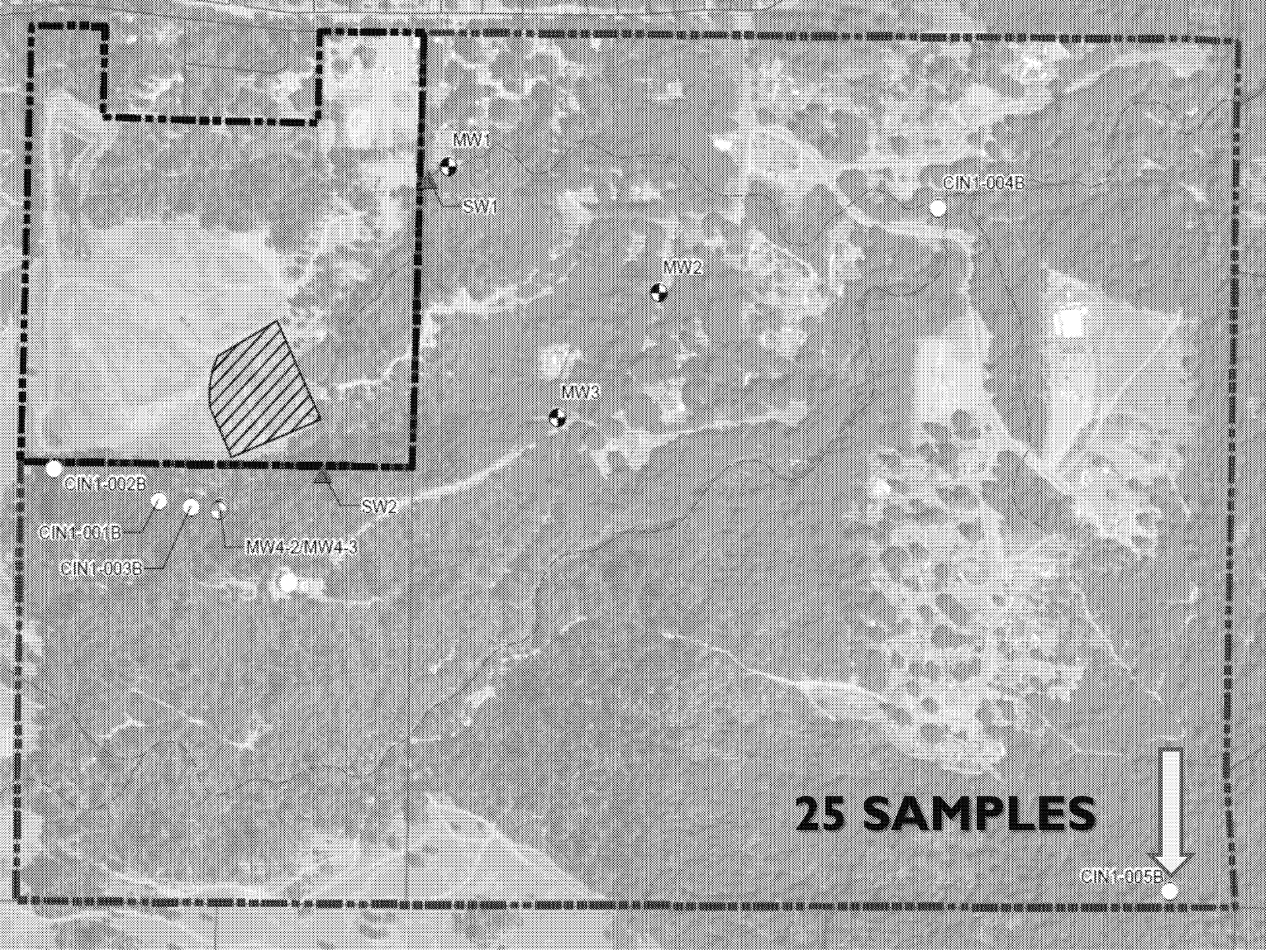
- Samples were taken in a radial pattern based on concentric circles at 10 ft. intervals.

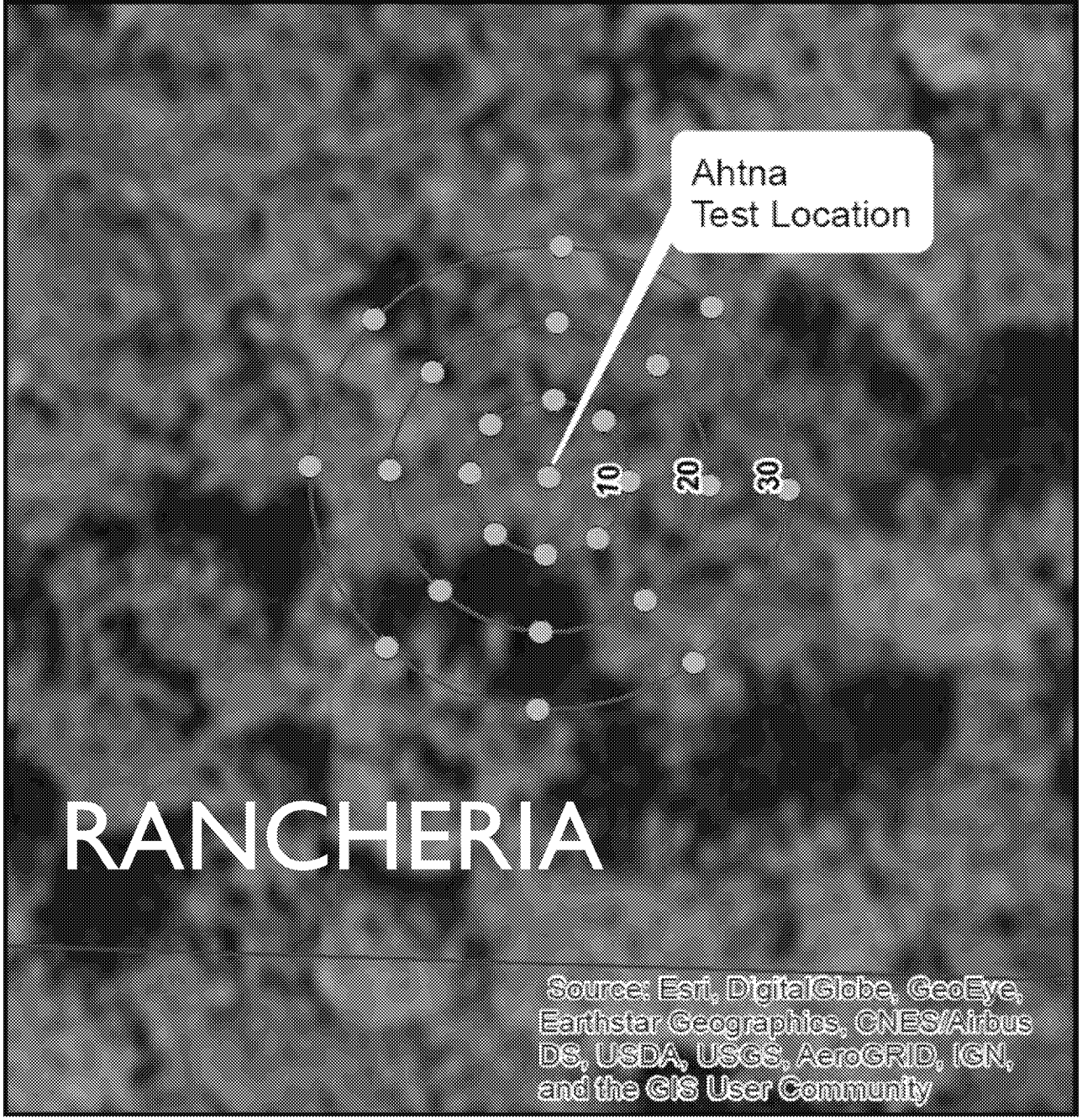

MW1
Analyte | Result (mg/L)
Chloroform | 0.00042J
CIN1-004B
Analyte | Result (mg/kg)
Arsenic | 6.3
SW1
MW2
MW3
Analyte | Result (mg/L)
Arsenic | 0.0015J
Chromium, hexavalent | 0.018
SW2
MW4-2/MW4-3
CIN1-002B
Analyte | Result (mg/kg)
Arsenic | 3.8
Chromium, hexavalent | 9.6
CIN1-003B
Analyte | Result (mg/kg)
Arsenic | 2.0
Lead | 140
CIN1-001B
Analyte | Result (mg/kg)
Arsenic | 2.8
CIN1-005B
Analyte | Result (mg/kg)
Arsenic | 2.0
Chromium, hexavalent | 3.6


MW1
SW1
CIN1-004B
25 SAMPLES
MW2
MW3
CIN1-002B
SW2
CIN1-001B
MW4-2/MW4-3
CIN1-003B
CIN1-005B



Ahtna Sample #CIN1-002B


MW1
SW1
CIN1-004B
MW2
MW3
CIN1-002B
CIN1-001B
CIN1-003B
SW2
MW4-2/MW4-3
25 SAMPLES
CIN1-005B

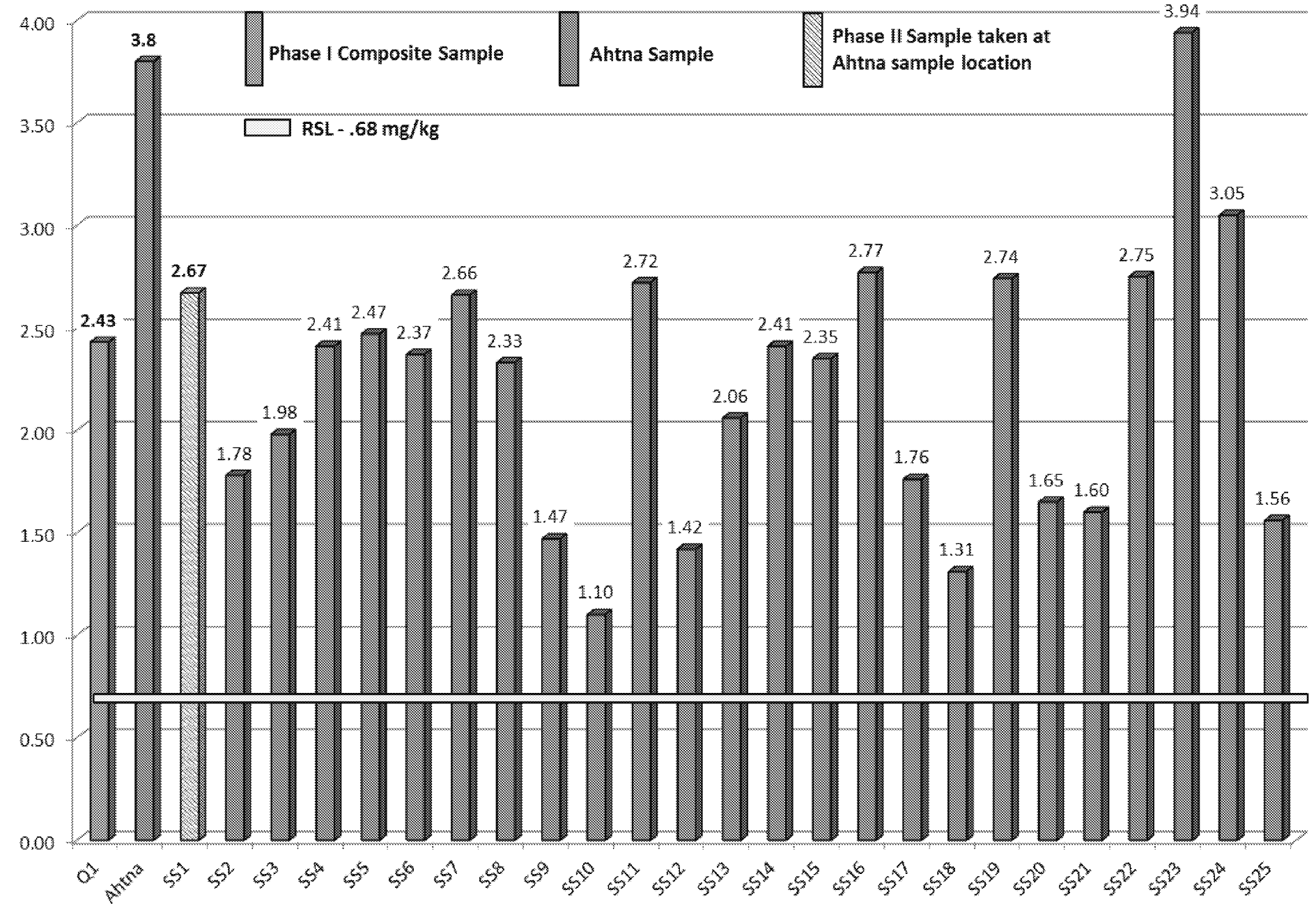


Ahtna Sample #CIN1-005B

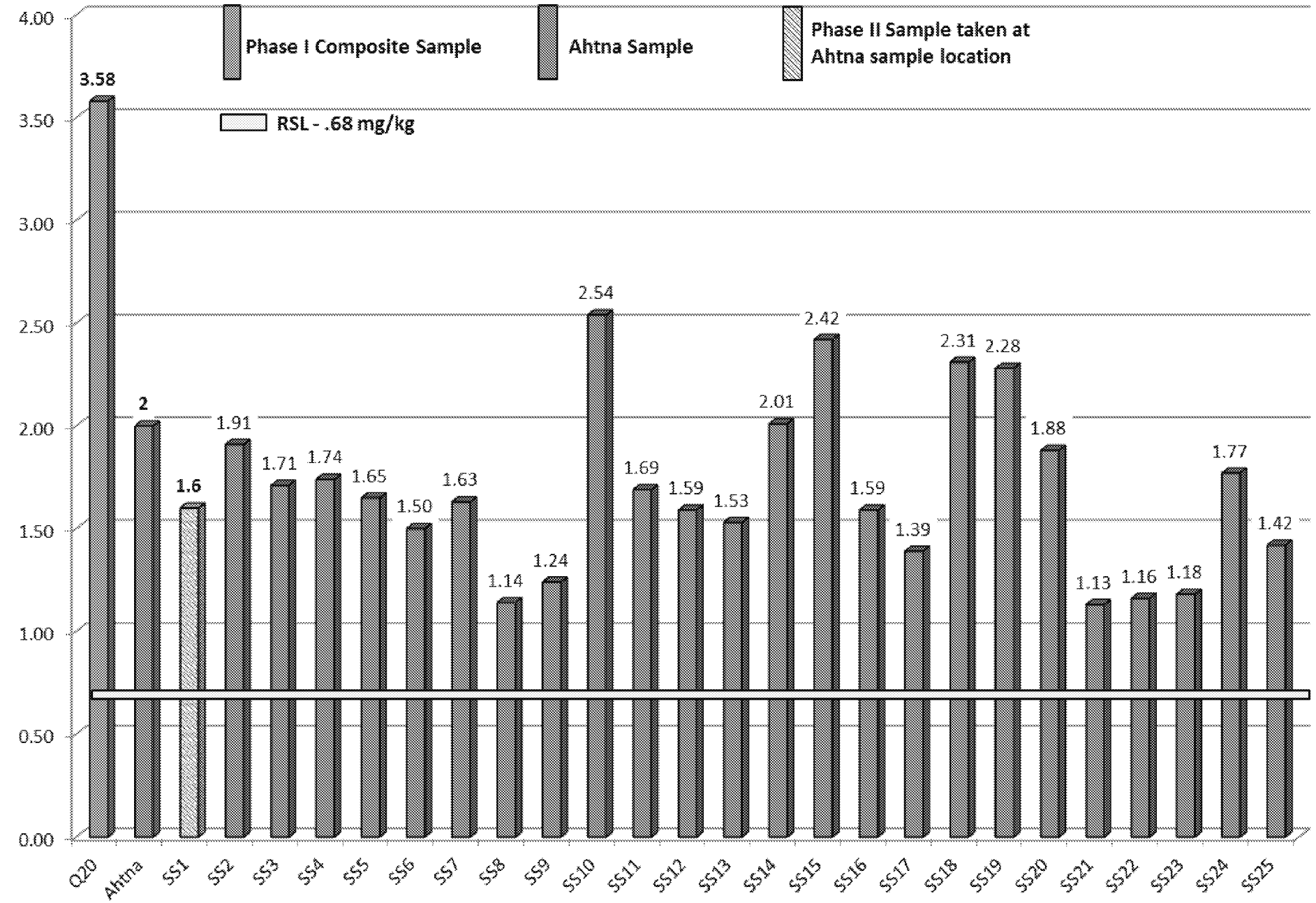
Phase III Test Results - Arsenic

- Soil samples results were similar to Phase I test results (composite samples).
- Test results confirmed presence of Arsenic.

Quadrant 1 - Arsenic

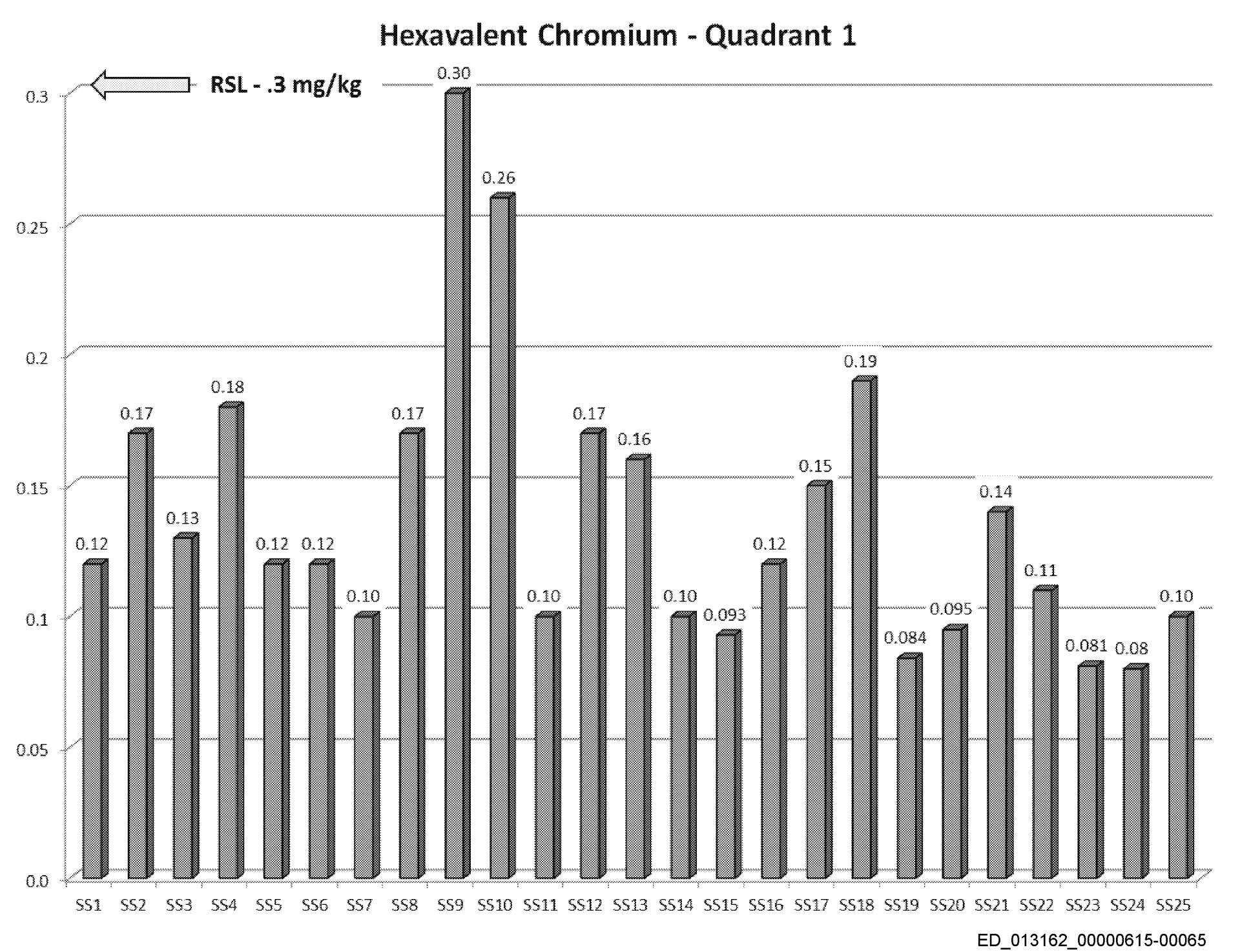


Quadrant 20 - Arsenic



Phase III Test Results – Hexavalent Chromium

- Test results detected Hexavalent Chromium, but at levels well below what was first reported.



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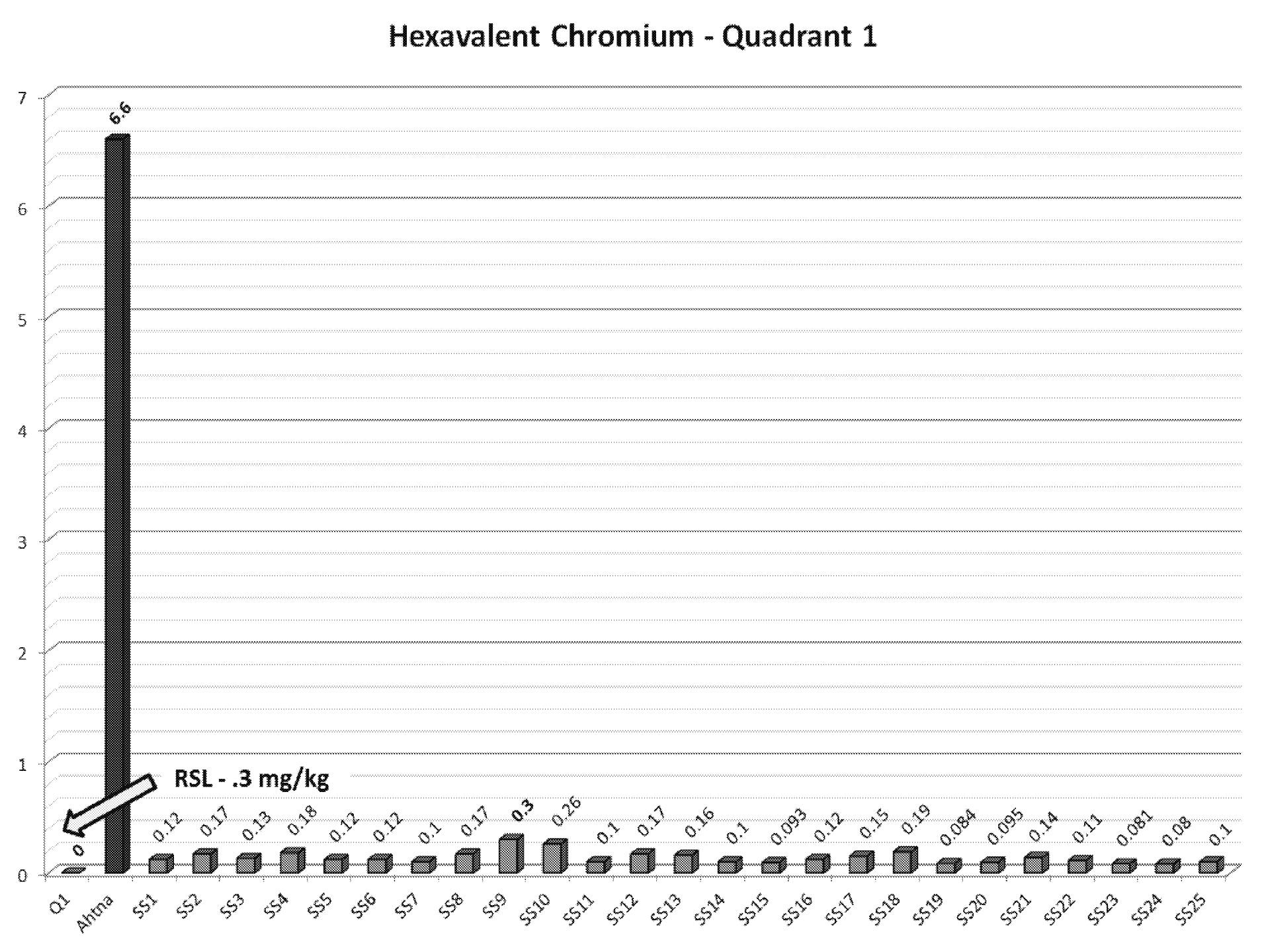
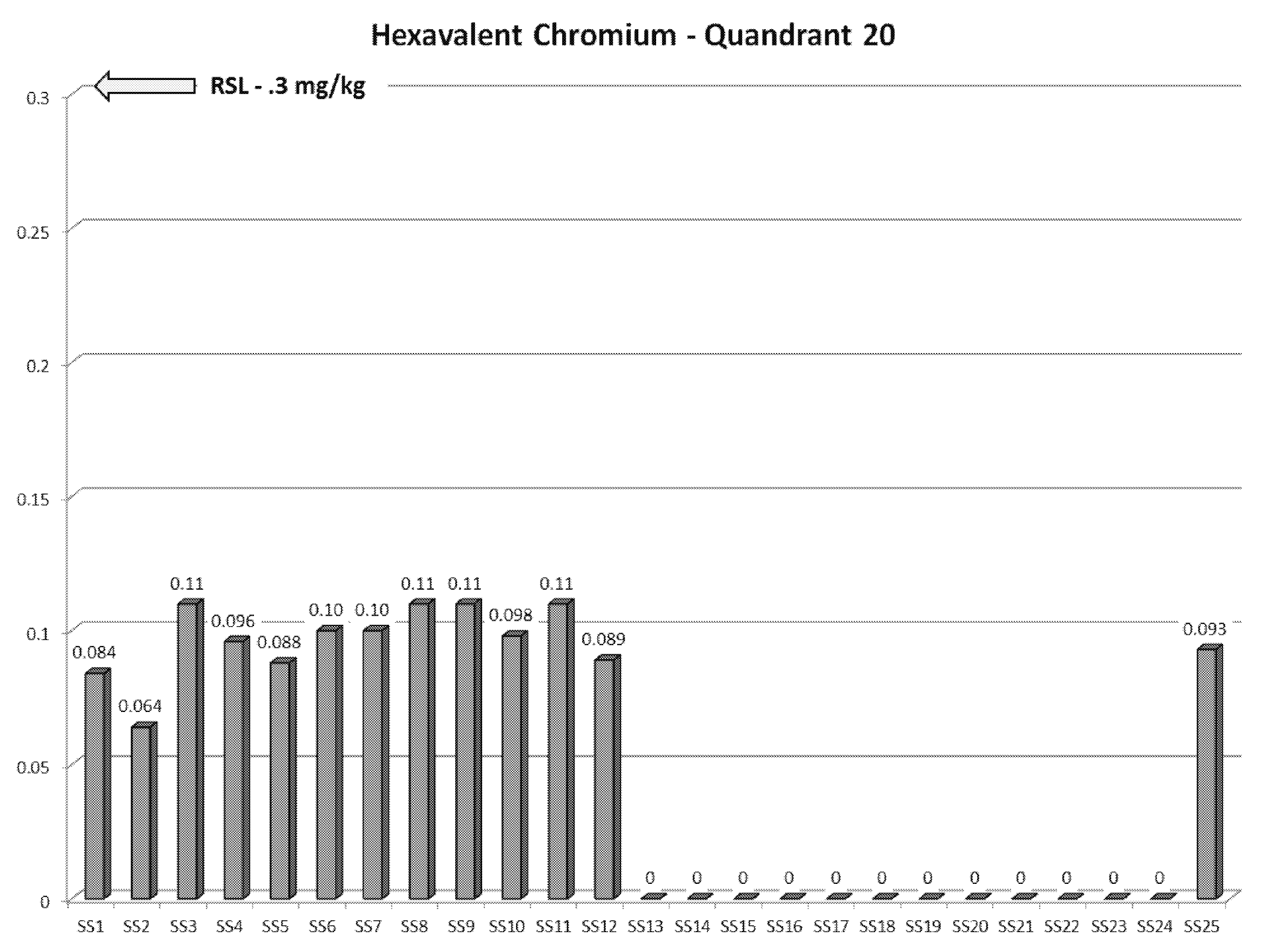

Hexavalent Chromium - Quadrant 1
7
6
5
4
3
2
1
0
6.6
RSL - .3 mg/kg
0
0.12
0.17
0.13
0.18
0.12
0.12
0.1
0.17
0.3
0.26
0.1
0.17
0.16
0.1
0.093
0.12
0.15
0.19
0.084
0.095
0.14
0.11
0.081
0.08
0.1
Q1
Ahtna
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11
SS12
SS13
SS14
SS15
SS16
SS17
SS18
SS19
SS20
SS21
SS22
SS23
SS24
SS25



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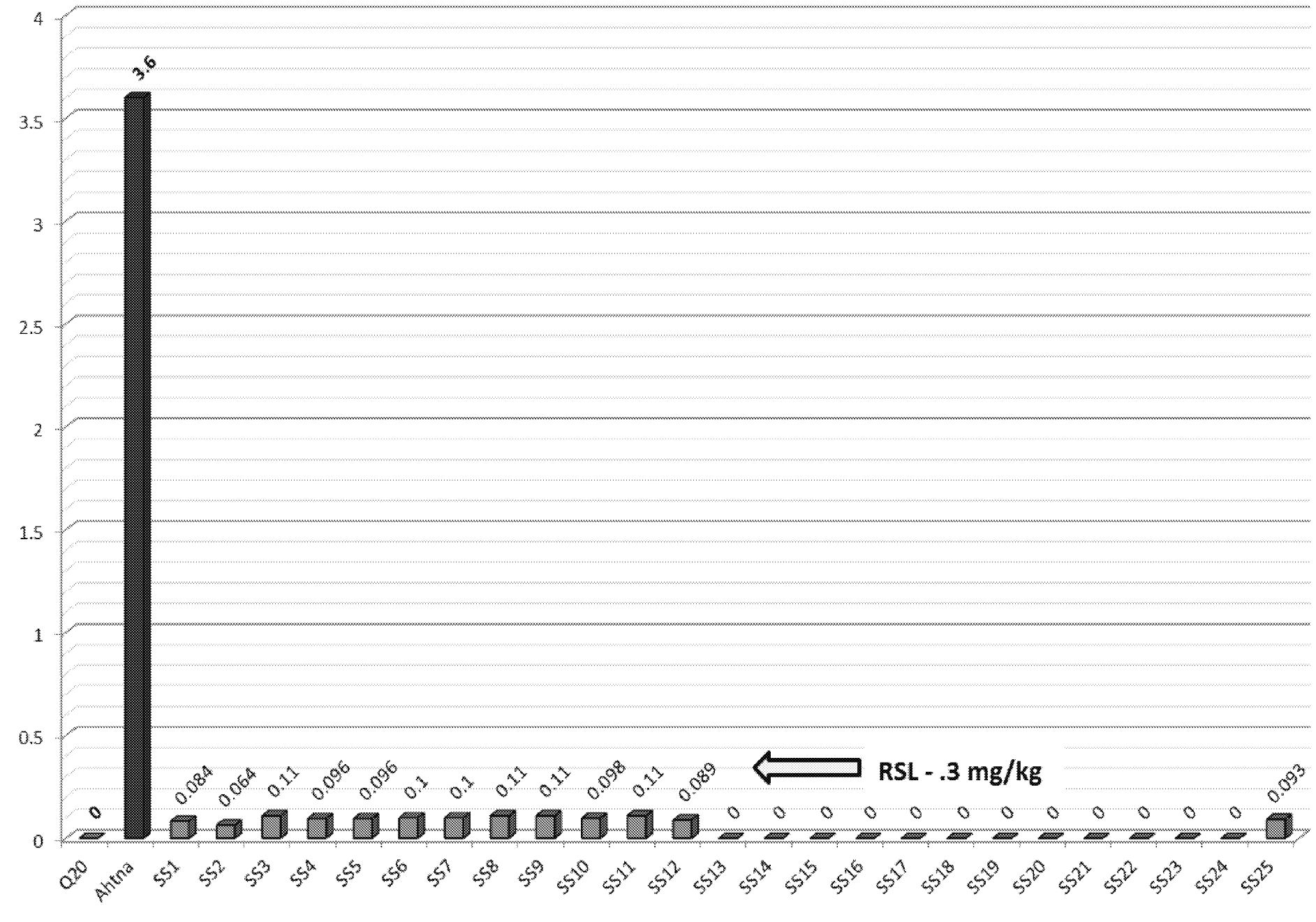
Hexavalent Chromium - Quadrant 20



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Phase III Test Results

- The test results only indicate that an analyte was or was not found at that location.
- These testing results do not infer or provide a determination as to the source of any detected analyte.

Questions?

Next Steps – Minimizing Exposure

- Air Quality – Burning of trash or other materials can contribute to lower air quality.
- Hazardous Materials – Pesticides, insecticides, and herbicides should be used sparingly and per label instructions.
- Hazardous Materials – Petroleum products or residues should be cleaned up as soon as a spill is noticed.
- Solid waste should be disposed of appropriately.

Next Steps – Minimizing Exposure

- Arsenic – ATSDR Recommendations:
  - Handling treated wood appropriately – gloves, saw dust.
  - Washing hands after handling treated wood or structures made of treated wood if using bare hands.
  - Limit contact with soil by use of dense ground cover, such as a lawn or other vegetation. Other options could include gravel or wood chips.
  - Dust and soil control in and around the home.

Questions?